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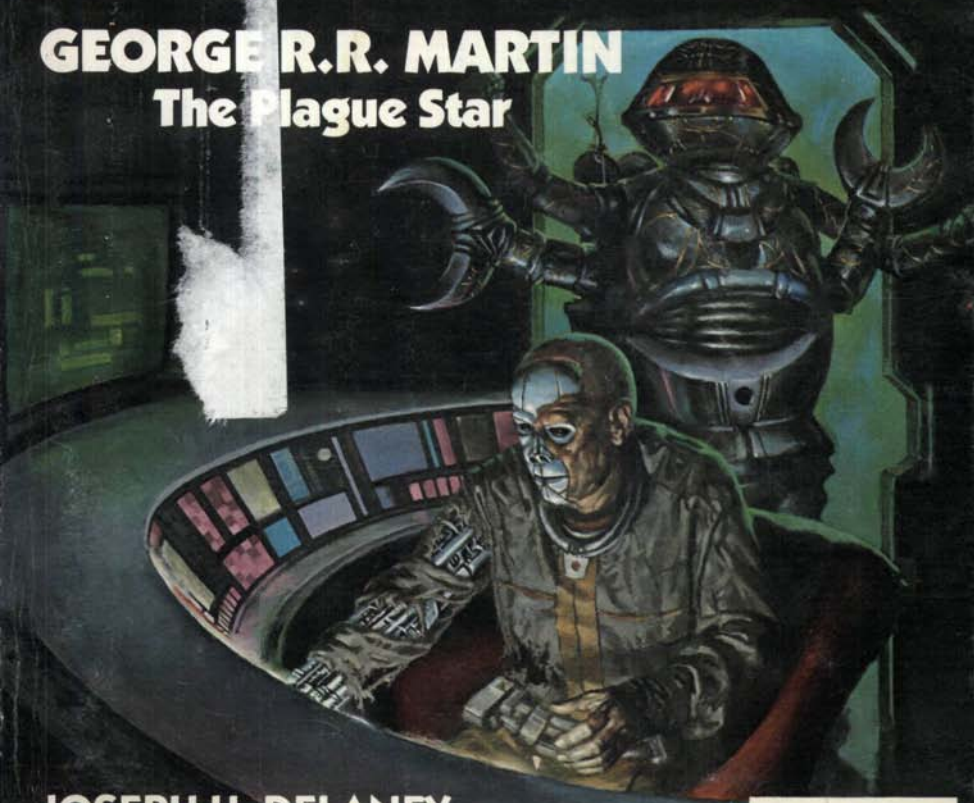

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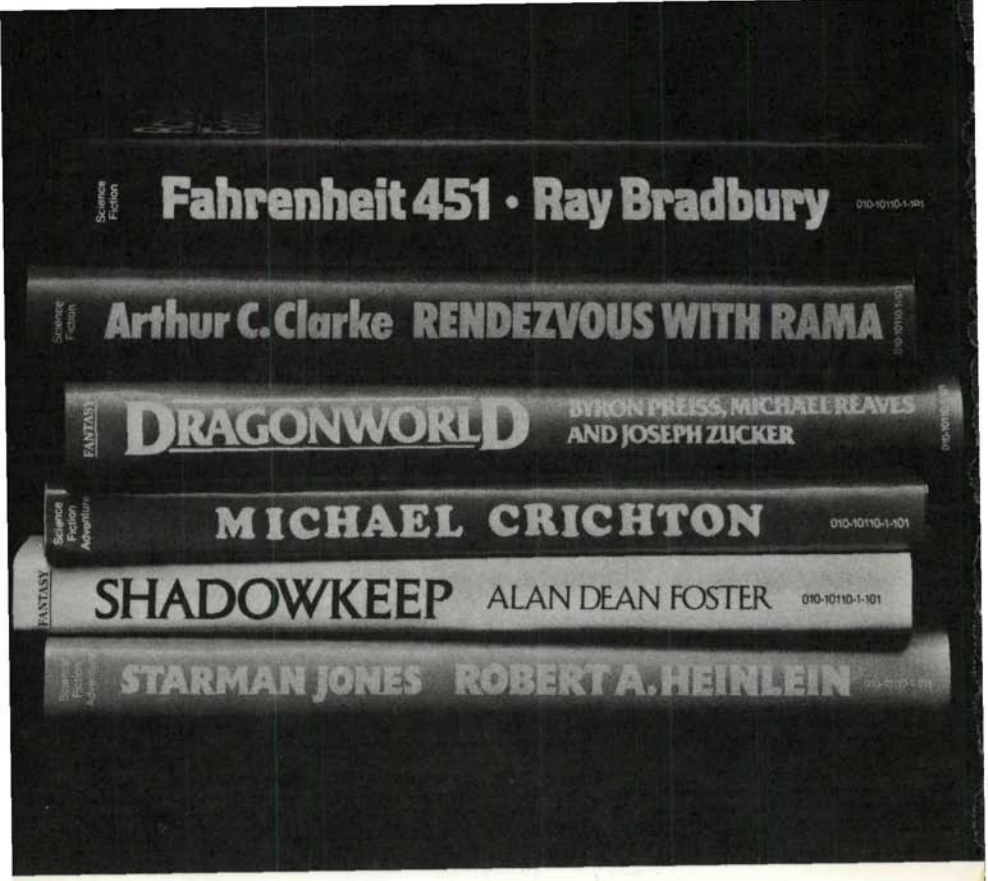

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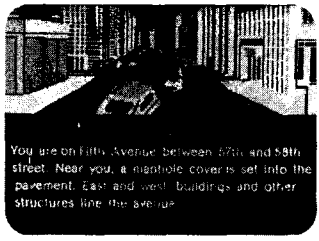
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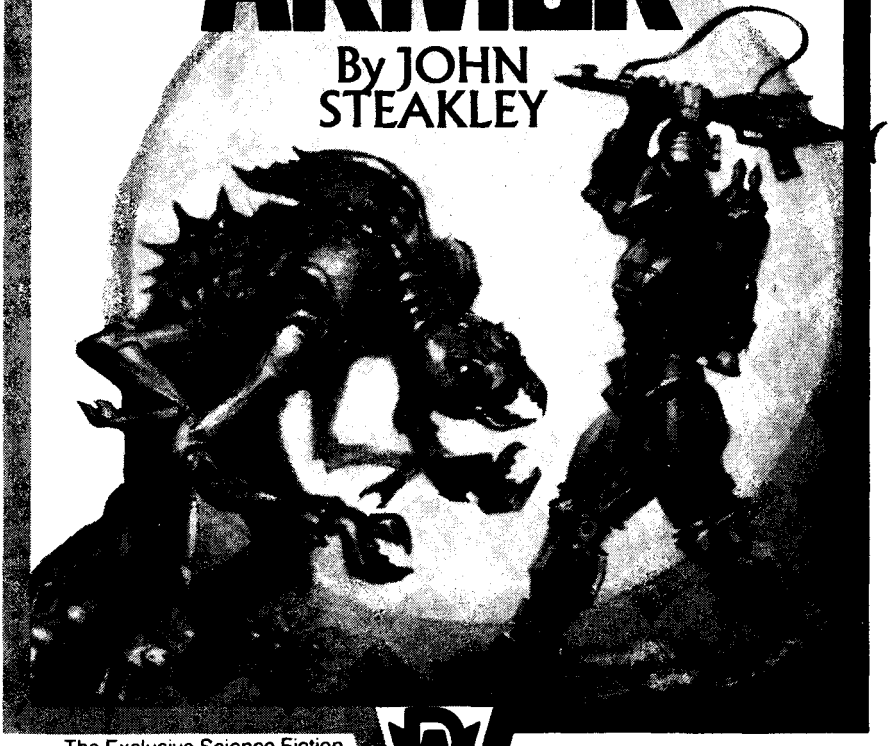

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Serial

THE PLAGUE STAR, George R. R. Martin, Part One of Two ____ 14

Novelettes

PAINKILLERS, Joseph H. Delaney ____ 98
THE SINGING OF THE VESTRY, THE PRAYING FOR THE SKY, Rick Shelley ____ 150

Science Fact

BIOFEEDBACK IN SPACE, Walter B. Hendrickson, Jr. ____ 58

Short Stories

CYCLES, Don Sakers ____ 64
A TOUCH BEYOND, Stephen L. Burns ____ 72
LIFEBOMB, Michael P. Kube-McDowell ____ 134

State of the Art

SCIENCE FICTION IS STILL TOO CONSERVATIVE!, G. Harry Stine ____ 89

Reader's Departments

THE EDITOR'S PAGE ____ 6
BIOLOG ____ 71
ON GAMING, Dana Lombardy ____ 97
THE ALTERNATE VIEW, G. Harry Stine ____ 146
IN TIMES TO COME ____ 149
PROBABILITY ZERO, John Gribbin ____ 174
THE REFERENCE LIBRARY, Tom Easton ____ 176
BRASS TACKS ____ 183
INDEX TO 1984 ____ 190
THE ANALOG CALENDAR OF UPCOMING EVENTS ____ 194

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Editorial

IF YOU CAN'T LICK 'EM...

Stanley Schmidt

A few years ago Poul Anderson wrote, "There absolutely has been no ecological balance, ever, when humans were around." At the time, the country was in the midst of a long overdue public concern about ecology, brought on in part by a sudden wave of realization that human "progress"—i.e., expansion of population and industry—had been pretty rough on many of the other creatures with whom we share this planet. Reading accounts of the herds of bison that used to blanket the Great Plains, and the flocks of passenger pigeons that darkened the sky with their passing, it did indeed seem that wherever man went, everything else was squeezed out.

But just as man's actions have not uniformly helped other species, other species are not uniformly as delicate and easy to get rid of as the more sentimental "ecologists" would have you believe.

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Poul's statement, in a guest editorial here, was an attempt to restore some semblance of balance to our thinking about this complex subject. Static equilibrium has *never* been the way of nature, even before there were humans. That statement is a concise summary of the story of evolution.

An English class I took once spent a couple of weeks bludgeoning the daylights out of a short poem describing a man's feelings on returning after several years' absence to a pond he had frequented as a youth. The poem, we were told, encapsulated the Profound Truth that, "Nature is immortal and unchanging, while man is mortal and changes constantly."

Well, that's half true, anyway. I found it so amusing that adults would seriously believe the other half that I sat down and penned a prose paraphrase wherein an observer arrived at the same Profound Truth by returning to a Mesozoic swamp. I'm not sure the teacher was amused. Maybe someday I should send her an apologetic postcard—perhaps one showing "before" and "after" pictures of Mt. St. Helens, with a few words about "the everlasting hills."

The fact is, as near as we can tell, that ecosystems have always been *quasi*-stable, functioning in a way that looks a lot like balance on a day-to-day basis, but always slowly evolving into something new. Sometimes not all that slowly, either—any farmer who has quit tilling a field and stayed on the farm has had a chance to watch plant succession in action. My wife and I have been watching an abandoned beaver pond near our home revert to meadow, and the change has been quite pronounced even in the very few years we've been here.

It's true that man tends to produce more obvious change faster than most other organisms. (Though he has yet to do anything approaching the ecocatastrophe wrought by the first blue-green algae, who destroyed an entire atmosphere and replaced it with a new one that poisoned nearly everything else then alive.) It also appears to be fairly generally true, at least through much of fairly recent history, that the changes man made were largely detrimental to other lifeforms. Hunting and habitat destruction destroyed some species, like the passenger pigeon, and reduced others to vestigial populations struggling to hang on in a few remote outposts. Bison and pronghorn dwindled to a few straggling herds on preserves. Deer and bear became things that urban, suburban, and even many rural children knew only from zoos and picture books. The only wildlife many Americans saw were pigeons, roaches, and rats.

And yet . . . in the *quite* recent past, I've begun to wonder. The damage (and I shall assume for the moment that damage is an apt word, though even that can be debated) has been real—but how permanent is it? Might we, in castigating ourselves for our ecological thoughtlessness, be overestimating our own power and importance?

I knew a long time ago that the coyote, despite bounty hunting, poisoning by ranchers, and other forms of vigorous persecution, had not only survived but greatly expanded its range. Once a strictly western critter, it now roams much of the country; but I thought that

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was an isolated exception.

Then I noticed that armadillos, commonly seen as road kills in parts of the south, were starting to show up outside the ranges indicated in books printed a couple of decades ago—and a little farther outside on each trip I made. Driving across eastern Wyoming, I saw so many pronghorn along a major highway that I gave up counting them.

When I was growing up in southwestern Ohio, I *never* saw wild deer or any sign of them, and my understanding was that there were only a few in the entire state. Now there are many thousands; they are hunted legally, and in some counties have become a significant road hazard. A deer population explosion seems to be a very widespread phenomenon. I know a place in Tennessee where they can often be seen grazing along an 11-mile loop road at dusk; when I started going there, seeing 15 or 20 in an hour's drive was impressive, but the numbers grew rapidly in successive years and in less than a decade 200 was not surprising. I talked to a ranger about the problems the rapid increase must be causing and he said that the best control would be a couple of pairs of resident cougars.

If you've been reading Analog regularly, you may recall my making a similar suggestion for Harriman State Park, the 80,000 acres near New York City which are also troubled by deer overpopulation. What I didn't mention then is that there was reason to suspect the problem might solve itself in that way without human intervention. Cougars, or mountain lions, have long been considered extinct in the eastern United States (except southern Florida). But I've been collecting indirect evidence

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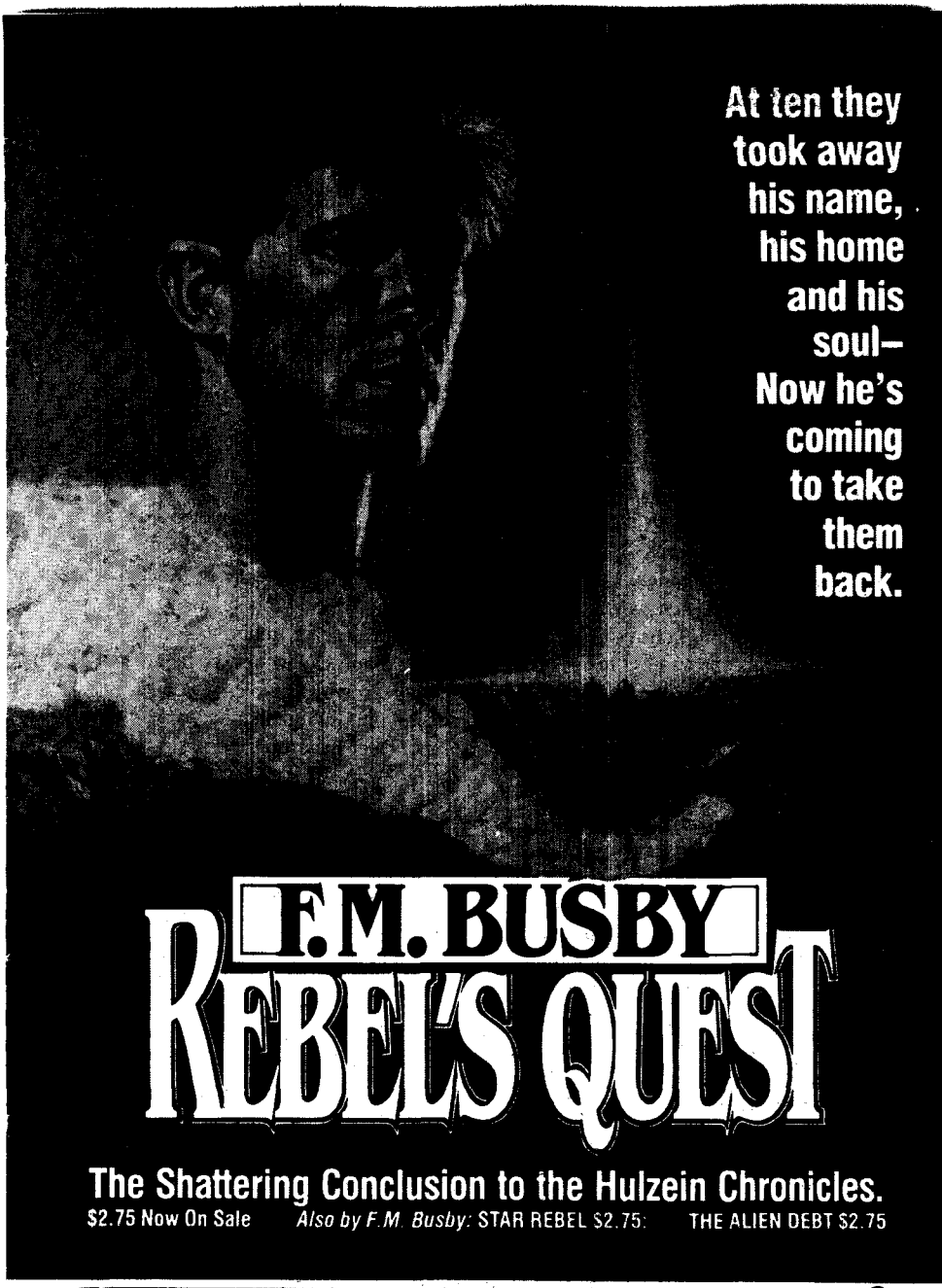
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that they were making a comeback for more than a decade. I've personally seen a few tracks and scats whose identity looked pretty clear except that they were hundreds of miles from where the books said they belonged. That ranger in Tennessee would not say so in an official capacity, but privately he said he was pretty sure at least a couple of cougars *had* recently appeared in his park. Rangers and naturalists in several other widely scattered areas had similar stories. None would say so officially, but all privately admitted they had seen evidence ranging from tracks to sightings to shootings and trappings. Cautious to the last, they always stressed that the animals captured might be escaped captives—but considering how many people keep pet cougars, the number shot or trapped began to look a little suspicious.

Well, it's official now. I recently saw an exhibit in the Minnesota Zoo stating that there had been numerous cougar sightings in northern Minnesota in recent years—the first such statement I had seen in print. Inspired by that, I checked to see whether any recent books had changed their tunes. I was delighted to find that the field guide to mammals published by the Audubon Society in 1980 now showed the cougar range including parts of Louisiana, Alabama, and Tennessee, and also mentioned occasional sightings in upper New York and New England. I don't know whether Harriman Park has any yet, but I would no longer be terribly surprised to find that it did.

And I know that at least a couple of black bears have been killed in or near the park in the last couple of years—and while those, too, were dismissed as "probably just strays or escapees," I wonder. Bears have been known all along to live a couple of mountain ranges away in at least two directions, and they can get around when they want to. . . .

Some of the resurgences of animal populations—the pronghorn, for example—appear to be largely the result of conscious human efforts at protection. Others, such as the cougars and the rapidly spreading coyotes and armadillos, do not. And while the shy cougars still appear to be limiting their reappearances to remote areas, many other species are much bolder. Raccoons, skunks, and opossums are presenting growing problems deeper and deeper into suburban and even urban areas. Deer have become pests in suburban backyard gardens, and coyotes have been found roaming streets well inside moderate-sized towns. Beavers have taken to building dams and lodges in the median strips of interstate highways in New York and Pennsylvania —traveling to and from the "outside world," I suspect, through manmade culverts.

It appears that many other animals, at the level of species if not of individuals, are a lot more resilient than we thought. I don't know exactly what the mechanisms of semi-extermination and recovery are, and my impression is that there's still a lot to be learned about them. It would seem that when cities first invaded an area, most of the resident wildlife fled in search of more fa-

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miliar habitat, or died because they could neither find new land that was both familiar and available, nor adjust to what their old territories had become. But it would also seem that as new individuals were born and went looking for real estate, they did learn to accept and even exploit the landscape as modified by man. Garbage cans may be to modern raccoons what fast-food chains are to modern humans.

And I see no reason to assume the process will not continue. Habitats are never really destroyed, only transformed into other habitats. Those new habitats will be filled, either by lifeforms already adapted to them or by ones that can learn to adapt. The transformation of habitats that accompanies the evolution of civilization is an extension of the transformation that accompanies all evolution. Man is not the first creature to change his environment —beavers and elephants, for example, have been doing so longer than we have—and the question of whether any particular transformation is "constructive" or "destructive" does not have a simple, automatic answer. The ecology of even the remoter parts of the Hawaiian Islands is now quite different from what it was just a few hundred years ago, thanks to the importation and naturalization of many plants and animals from elsewhere, which are carving their own niches in competition with native forms. But can we automatically assume that the "old" ecosystem was necessarily "better" than the new (or vice versa)? I'm not so sure.

I *am* reasonably sure that ecology is a dynamic, ever-changing thing, and that lots of animals which at first seemed unable to coexist with humans are now finding that they can. I venture to hope that this time we can learn that, too. ■

● I believe that man will not merely endure; he will prevail. He is immortal, not because he alone among creatures has an inexhaustible voice, but because he has a soul, a spirit capable of compassion and sacrifice and endurance.

● The man who has everything figured out is probably a fool. College examinations notwithstanding, it takes a very smart fella tc say "I don't know the answer."

Jerome Lawrence and Robert E. Lee

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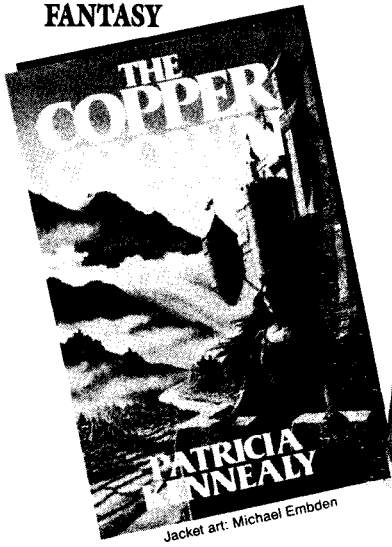

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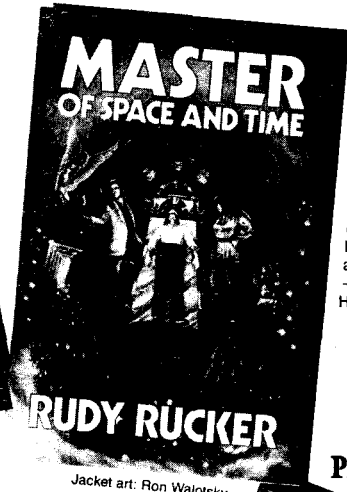

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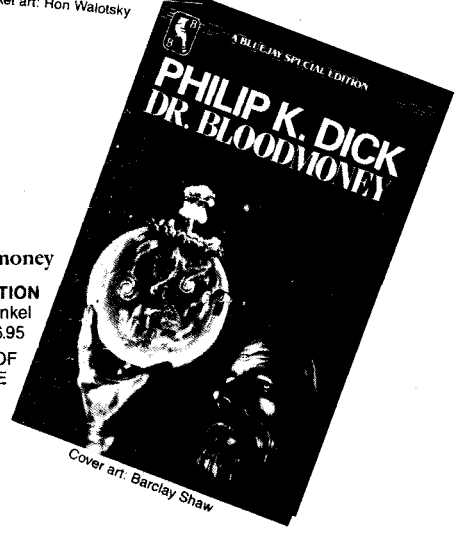

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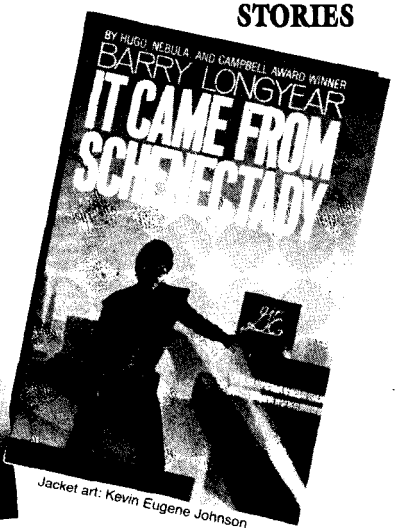

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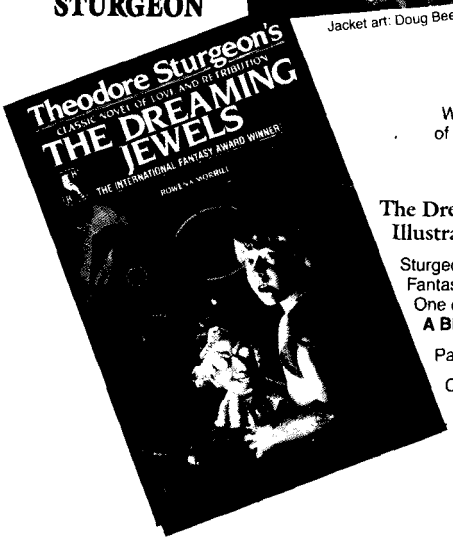

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THE PLAGUE STAR

Part One of Two

The plague star was not a star, exactly; legends tend to distort facts a bit. But they may retain a kernel of truth. . . .

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"No," Kaj Nevis told the others firmly. "That's out. We'd be damned stupid to involve any of the big transcorps."

"Oh, stuff and nonsense," Celise Waan snapped back at him. "We have to get there, don't we? So we need a ship. I've chartered ships from Starslip before, and they're perfectly comfortable. The crews are polite and the cuisine is more than adequate."

Nevis gave her a withering look. He had a face made for it: sharp and angular, with hair swept back hard and a great scimitar of a nose, his small dark eyes half-hidden by heavy black eyebrows. "For what purpose did you charter these ships?"

"Why, for field trips, of course," Celise Waan replied. She plucked another cream ball from the plate in front of her, lifting it delicately between thumb and forefinger and popping it into her mouth. "I've supervised many important researches. The Center provided the funding."

"Let me point out the nose on your damn face," Nevis said. "This is not a field trip. We are not poking into the mating habits of primitives. We are not digging around for obscure knowledge that no sane person could possibly give a damn about, as you're accustomed to do. This little conspiracy of ours is about to go after a treasure of almost unimaginable value. If we find it, we don't intend to turn it over to the proper authorities, either. You need me to see to its disposition through less-than-licit channels. And you trust me so little that you won't tell where the damn thing is until we're underway, and Lion here has hired a bodyguard. Fine, I don't give a damn. But understand this—I am not the only untrustworthy man on ShanDellor. Vast profit is involved here, and vast power. If you're going to continue to yammer at me about *cuisine*, then I'm leaving. I have better things to do than sit here counting your chins."

Celise Waan snorted disdainfully. She was a big, round, red-faced woman, with a loud, wet snort. "Starslip is a reputable firm," she said. "Besides, the salvage laws—"

"—are meaningless," said Nevis. "We have one set of laws here on ShanDellor, another on Kleronomas, a third on Maya, and none of them means a damn thing. And if ShanDi law did apply, we'd get only one-quarter the value of the find. If we got anything at all. Assuming this plague star of yours is really what Lion thinks it is, and assuming that it's still in working order, whoever controls it will enjoy an overwhelming military superiority in this sector. Starslip and the other big transcorps are as greedy and ruthless as I am, I promise you. Furthermore, they are big enough and powerful enough so that the planetary governments watch them closely. In case it has escaped your notice, let me point out that there are only four of us. Five if you count the hireling," he said, nodding toward Rica Dawnstar, who favored him with an icy grin. "A big liner has more than five pastry chefs. Even on a small courier, we'd be outnumbered by the crew. Once they saw what we had, do you imagine for even a second that we'll be allowed to keep it?"

"If they cheat us, we'll sue them," the fat anthropologist said, with a hint

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of petulance in her voice. She plucked up the last cream ball.

Kaj Nevis laughed at her. "In what courts? On what world? That's assuming we're allowed to live, which is unlikely on the face of it. You are a remarkably stupid and ugly woman."

Jefri Lion had been listening to the squabble with an uncomfortable expression on his face. "Here, here," he interrupted at last. "Let's have no name-calling, Nevis. No call for it. We're all in this together, after all." A short, square block of a man, Lion wore a chameleon cloth jacket of military cut, decorated with rows of ribbons from some forgotten campaign. The fabric had turned a dusty gray in the dimness of the small restaurant, a gray that matched the color of Lion's bristling spade-shaped beard. There was a thin sheen of sweat on his broad, balding forehead. Kaj Nevis made him nervous; the man had a reputation, after all. Lion looked around to the others for support.

Celise Waan pouted and stared at the empty plate in front of her, as if her gaze could fill it with cream balls again. Rica Dawnstar—"the hireling," as Nevis called her—leaned back in her seat with a look of sardonic amusement in her bright green eyes. Beneath her drab jumpsuit and silvery mesh-steel vest, the long, hard body looked relaxed, almost indolent. No concern of hers if her employers wanted to argue all night and all day.

"Insults are useless," Anittas said. It was hard to tell what the cybertech was thinking; his face was as much polished metal and translucent plastic as flesh, and only minimally expressive. The shiny bluesteel fingers of his right hand interlocked with the mocha-colored fleshy digits of his left; he studied Nevis with two shining silver-metal eyes that moved smoothly in black plastic sockets. "Kaj Nevis has made some valid points. He is experienced in these areas, where we are not. What is the use of having brought him into this affair if we are unwilling to listen to his counsel?"

"Yes, that's so," Jefri Lion agreed. "What do you suggest then, Nevis? If we must avoid the transcorps, how will we reach the plague star?"

"We need a ship," Celise Waan said, loudly stating the obvious.

Kaj Nevis smiled. "The transcorps have no monopoly on ships. That's why I suggested we meet here today, rather than at Lion's office. This dump is close to the port. The man we want will be here, I'm sure."

Jefri Lion looked hesitant. "An independent? Some of them have rather, uh, unsavory reputations, don't they?"

"Like me," Nevis reminded him.

"Still. I've heard rumors of smuggling, even piracy. Do we want to take that kind of a chance, Nevis?"

"We don't want to take any chances at all," Kaj Nevis said. "And we won't. It's a matter of knowing the right people. I know a lot of people. The right people. The wrong people." He made a small gesture with his head. "Now, way in the back there, that dark woman with all the black jewelry. That's Jessamyn Caige, mistress of the *Free Venture*. She'd hire out to us, no doubt. At a very reasonable rate."

Celise Waan craned around to look. "Is she the one, then? I hope this ship

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of hers has a gravity grid. Weightlessness makes me nauseous."

"When are you going to approach her?" Jefri Lion asked.

"I'm not," Kaj Nevis told them. "Oh, I've used Jessamyn to move a cargo or two for me, but I won't take the risk of actually riding with her, and I'd never dream of involving her in anything this big. The *Free Venture* has a crew of nine. More than enough to handle me and the hireling. No offense, Lion, but the rest of you don't count."

"I'll have you know I'm a soldier," Jefri Lion said, in a wounded tone. "I've seen combat."

"A hundred years ago," Nevis said. "As I said, the rest of you don't count. And Jessamyn would as soon kill all of us as spit." The small, dark eyes regarded each of them in turn. "That's why you need me. Without me, you are just naive enough to engage Jessamyn, or one of the transcorps."

"My niece serves with a very successful independent trader," Celise Waan said.

"And who might that be?" Kaj Nevis inquired.

"Noah Wackerfuss," she said, "of the *World of Bargains*."

Nevis nodded. "Fat Noah," he said. "That would be a lot of fun, I'm damn sure. I might mention that *his* ship is kept constantly in weightlessness. Gravity would kill the old degenerate. Not that it matters. Wackerfuss isn't especially blood-thirsty, that's so. Fifty-fifty chance he wouldn't kill us. He is, however, as greedy and as shrewd as they come. At the very least, he'd find a way to get a full share. At worst, he'd get it all. And his ship has a crew of twenty. All women. Have you ever asked your niece about the precise nature of her duties?"

Celise Waan flushed. "Do I have to listen to this man's innuendoes?" she asked Jefri Lion. "This was my discovery. I won't be insulted by this third-rate hoodlum, Jefri."

Lion frowned unhappily. "Really now, enough of this squabbling. Nevis, there's no need to flaunt your expertise. We brought you into this for good cause, I'm sure we all agree. You must have some idea of whom we can engage to take us to the plague star, don't you?"

"Of course," Nevis agreed.

"Who?" prompted Anittas.

"The man is an independent trader, of sorts. Not a very successful one. And he's been stuck on ShanDellor, for want of a cargo, for half of a standard year now. He must be getting desperate. Desperate enough, I'd think, so that he'll jump at this opportunity. He has a small, battered ship with a long, ridiculous name. It's not luxurious, but it will take us there, which is all that matters. There's no crew to worry about, only the man himself. And he—well, he's a little ridiculous too. He'll give us no trouble. He's big, but soft, inside and out. He keeps cats, I hear. Doesn't much like people. Drinks a lot of beer, eats too much. I doubt that he even carries a weapon. Reports are that he barely scrapes by, flitting from world to world and selling absurd trinkets and useless little geegaws from this beat-up old ship of his. Wackerfuss thinks the man's a joke. But even if that's wrong, what can he do, one man alone? If he so much as threatens to

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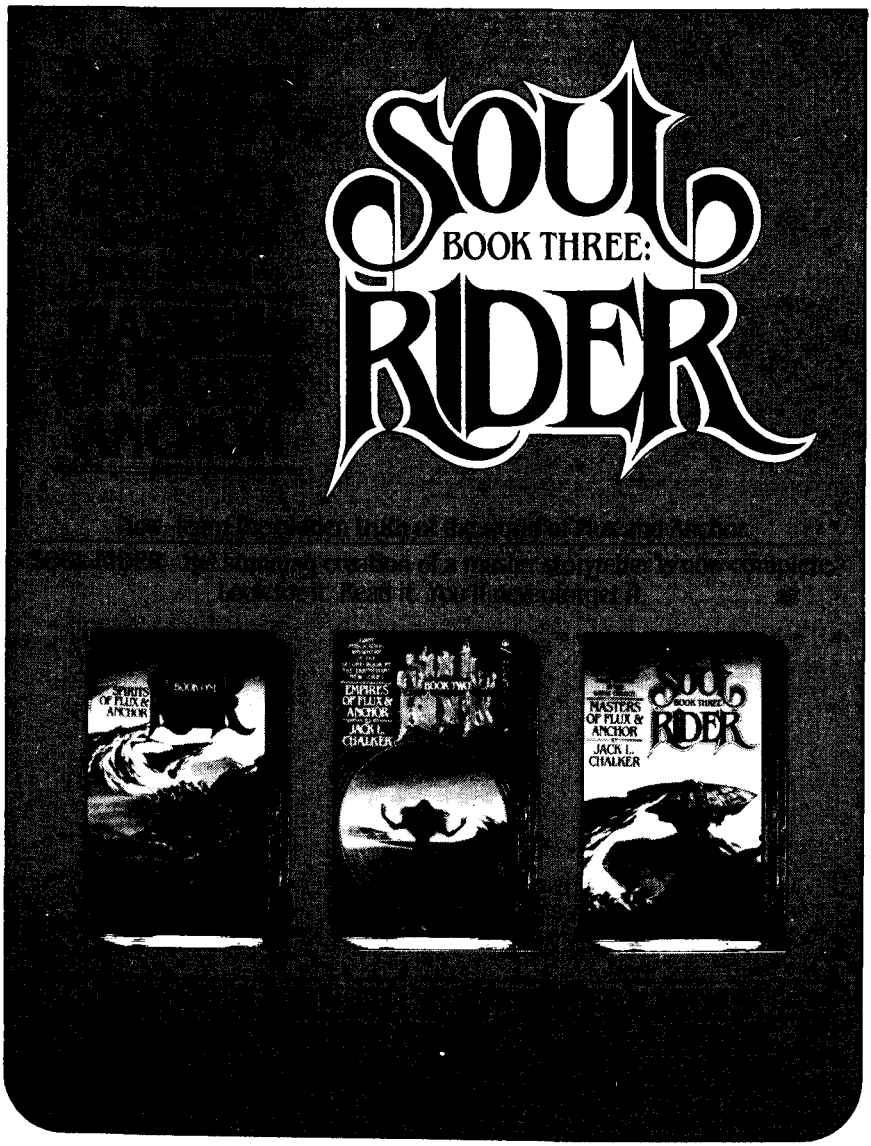

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report us, the hireling and I can dispose of him and feed him to his cats."

"Nevis, I'll have no talk like that!" Jefri Lion objected. "I won't have any killing on this venture."

"No?" Nevis said. He nodded toward Rica Dawnstar. "Then why did you hire her?" His smile was very nasty, somehow; her returning grin was pure mocking malice. "Just so," Nevis said, "I knew this was the place. Here's our man now."

None of them except Rica Dawnstar was much versed in the art of subtle conspiracy; the other three all turned to stare at the door, and the man who had just entered. He stood very tall, almost two-and-a-half meters, and his great soft gut swelled out above his thin metal belt. He had big hands, a long, curiously blank face, and a stiff, awkward posture; everywhere his skin was as white as bleached bone, and it appeared that he had not a hair on him anywhere. He wore shiny blue trousers and a deep maroon shirt whose balloon sleeves were frayed at the ends.

He must have felt their scrutiny, for he turned his head and stared back, his pale face expressionless. He kept on staring. Celise Waan looked away first, and then Jefri Lion, and finally Anittas. "Who is he?" the cyborg demanded of Kaj Nevis.

"Wackerfuss calls him Tuffy," Nevis said. "His real name, I'm told, is Haviland Tuf."

Haviland Tuf picked up the last of the green star-forts with a delicacy that belied his great size, then straightened to regard the gaming board with satisfaction. The entire cluster was red; cruisers and dreadnaughts and star-forts and all the colonies, red everywhere. "I must claim the victory," he said.

"Again," said Rica Dawnstar. She stretched, to untie the knots that hours bent over the game had put in her limbs. She had the deadly grace of a lioness, and beneath her silver mesh-steel vest her needler was snug in its shoulder holster.

"Perhaps I might be so bold as to suggest another contest," said Haviland Tuf.

Dawnstar laughed. "No thanks," she said. "You're too good at this. I was born a gambler, but with you it's no gamble. I'm tired of coming in second."

"I have been most fortunate in the games we have played thusfar," Haviland Tuf said. "Undoubtedly my luck will have run its course by now, and you will obliterate my poor forces on your next attempt."

"Oh, undoubtedly," Rica Dawnstar replied, grinning, "but forgive me if I postpone the attempt until the boredom becomes terminal. At least I'm better than Lion. Right, Jefri?"

Jefri Lion was seated in a corner of the ship's control room, perusing a stack of old military texts. His chameleon cloth jacket had turned the same brown as the synthawood paneling of the bulkhead behind him. "The game does not conform to authentic military principles," he said, with a hint of annoyance in his voice. "I employed the same tactics that Stephen Cobalt Northstar used when the 13th Human Fleet enveloped Hrakkean. Tuf's counterthrust was completely wrong under the circum-

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stances. If the rules had been written properly, it ought to have been routed."

"Indeed," said Haviland Tuf. "You have the advantage of me, sir. You, after all, have the good fortune to be a military historian, and I am merely a humble trader. I lack your familiarity with the great campaigns of history. How fortunate for me that thus far the deficiencies of the game itself, and my extraordinary fortune, have conspired to make up for my ignorance. Still, I would welcome the opportunity to strengthen my grasp of military principles. If you would care to assay the game once again, I will carefully study your subtle strategies so that I might in future incorporate a sounder, more authentic approach into my own poor play."

Jefri Lion, whose silver fleet had been first eliminated in every game they played during the past week, cleared his throat and looked uncomfortable. "Yes, uh, you see, Tuf," he began.

He was saved from embarrassment by a sudden shriek and a stream of profanity that issued from the adjoining compartment. Haviland Tuf was on his feet at once; Rica Dawnstar was right behind him.

They emerged into the passageway just as Celise Waan staggered out of the living quarters in pursuit of a small, fleet black-and-white form that went hurtling past them into the control room. "Catch it!" Celise Waan screamed at them. Her face was red and puffy and swollen, and she looked furious.

The door was small, Haviland Tuf large. "For what purpose, might I inquire?" he asked, blocking the way.

The anthropologist held out her left hand. There were three short, deep scratches across her palm, welling blood. "Look what it did to me!" she said.

"Indeed," said Haviland Tuf. "And what did you do to her?"

Kaj Nevis emerged from the living quarters with a thin, hard smile on his face. "She picked it up to toss it across the room," he said.

"It was on my bed!" said Celise Waan. "I wanted to take a little nap, and the damned creature was asleep on my bed!" She whirled to face Nevis. "And you, wipe that smirk off your face, it's bad enough we all have to be cooped up together in this shabby little ship, I simply refuse to share what little space there is with this impossible man's filthy little *animals*. And it's *your* fault, Nevis. You got us into this! Now do something. I demand that you make Tuf get rid of those vicious pests, do you hear me, I demand it!"

"Excuse me," Rica Dawnstar said from behind Tuf. He glanced back at her and moved aside. "Is this one of the vicious pests you had in mind?" Dawnstar asked with a grin, as she stepped into the passageway. She was cradling a cat against her chest with her left hand, and petting it with her right. It was a huge tom with long soft gray hair and arrogant yellow eyes; it must have weighed twenty pounds, but Rica held it as easily as if it had been a kitten. "What do you propose Tuf do with old Mushroom here?" she asked as the cat began to purr.

"It was the other one that hurt me, the black-and-white one," Celise Waan said, "but that one's just as bad. Look at my face! Look at what they've done to me! I can scarcely breathe, and I'm

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breaking out all over, and whenever I try to get a little sleep I wake up with one of them on my chest. Yesterday I was having a little snack, and I put it down just for a moment, and when I came back the black-and-white one had knocked over my plate and was rolling my spice-puffs around in the dirt as if they were toys! Nothing is safe around these animals. I've lost two light pencils and my best pinky ring. And now *this*, this *attack!* Really, this is just intolerable. I must insist that these damned animals be put down in the cargo hold at once. *At once*, do you hear?''

''My hearing is quite adequate, thank you,'' said Haviland Tuf. ''If your missing property has not turned up by the end of our voyage, I will be most pleased to reimburse you for its value. Your request in regard to Mushroom and Havoc, however, I must regretfully deny.''

''I'm a passenger on this joke of a starship!'' Celise Waan screamed at him.

''Must you insult my intelligence as well as my hearing?'' Tuf replied. ''Your status as a passenger here is obvious, madam; it is not necessary for you to point it out. Permit me to point out, however, that this small ship which you feel so free to insult is my home and my livelihood, such that it is. Furthermore, while you are undeniably a passenger here and therefore enjoy certain rights and prerequisites, Mushroom and Havoc must logically have substantially greater rights, since this is their permanent abode, so to speak. It is not my custom to take passengers aboard my *Cornucopia of Excellent Goods at Low Prices*. As you have observed, the space available is scarcely adequate to my own needs. Regretfully, I have suffered various professional vicissitudes of late, and there is no gainsaying the fact that my supply of standards was veering toward inadequacy when Kaj Nevis approached me. I have bent all my efforts to accomodate you aboard this craft which you so malign, to the extent that I have given over my ship's living quarters to your collective needs and made my own poor bed in the control room. Despite my undeniable need, I am now coming deeply to regret the foolish and altruistic impulse that bid me take this charter, especially as the payment I have received was barely sufficient to refuel and provision for this voyage and pay the ShanDi landing tax. You have taken grievous advantage of my gullibility, I fear. Nonetheless, I am a man of my word and will do my best to convey you to this mysterious destination of yours. For the duration of the voyage, however, I must require you to tolerate Mushroom and Havoc, even as I tolerate you.''

''Well, I never!'' Celise Waan declared.

''I have no doubt,'' said Haviland Tuf.

''I'm not going to put up with this any longer,'' the anthropologist said. ''There's no reason we all have to be crammed up inside one room like soldiers in a barracks. This ship was not nearly this small from outside.'' She pointed a pudgy arm. ''Where does that door go?'' she demanded.

''To the hold and cargo compartments,'' Haviland Tuf said evenly. ''There are sixteen of them. Even the

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smallest, admittedly, has twice the space of my meager living quarters."

"Aha!" said Waan. "And are we carrying any cargo?"

"Compartment sixteen is packed with plastic reproductions of Cooglish orgy-masks, which I was unfortunately unable to sell on ShanDellor, a situation I lay entirely at the door of Noah Wackerfuss, who undercut my price and deprived me of my small hope of profit. In compartment twelve I store certain personal effects, miscellaneous equipment, collectibles, and bric-a-brac. The rest of the ship is quite empty, madam."

"Excellent!" said Celise Waan. "In that case, we will convert the smaller compartments into private rooms for each of us. It should be a simple matter to move our bedding."

"Quite simple," said Haviland Tuf.

"Then do it!" snapped Celise Waan.

"As you wish," said Tuf. "Will you be wanting to rent a pressure suit?"

"What?"

Rica Dawnstar was grinning. "The holds aren't part of the life-support system," she said. "No air. No heat. No pressure. No gravity, even."

"Ought to suit you just fine," Kaj Nevis put in.

"Indeed," said Haviland Tuf.

Day and night are meaningless aboard a starship, but the ancient rhythms of the human body still made their demands, and technology must conform. Therefore the *Cornucopia*, like all but the huge triple-shift warships and transcorp liners, had its sleep cycle, a time of darkness and silence.

Rica Dawnstar rose from her cot, and checked her needler from long force of habit. Celise Waan was snoring loudly; Jefri Lion tossed and turned, winning battles in his head; Kaj Nevis was lost in dreams of wealth and power. The cybertech was sleeping too, though it was a deeper sort of sleep. To escape the boredom of the voyage, Anittas had parked on a cot, plugged into the ship's computer, and turned himself off. His cyberhalf monitored his biohalf; his breath was slow as a glacier and very regular. His body temperature was down, his energy consumption cut to almost nothing, but the lidless silver-metal sensors that served him as eyes sometimes seemed to shift slightly, tracking some unseen vision.

Rica Dawnstar moved quietly from the room. Up in the control chamber, Haviland Tuf sat alone. His lap was full of gray tomcat; his huge pale hands moved over the computer keys. Havoc, the smaller black-and-white cat, was playing around his feet. She had gotten hold of a light pencil and was batting it to and fro on the floor. Tuf never heard Rica enter; no one heard Rica Dawnstar move unless she wanted them to hear.

"You're still up," she said from the door, leaning back against the jamb.

Tuf's seat swiveled around and he regarded her impassively. "A most remarkable deduction," he said. "Here I sit before you, active, busy, driven by the demands of my ship. From the scant evidence of your eyes and ears, you leap to the conclusion that I am not yet asleep. Your powers of reasoning are awesome."

Rica Dawnstar sauntered into the room and stretched out on Tuf's cot, still neatly made-up from the previous

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sleep cycle. "I'm awake too," she said, smiling.

"I can scarcely believe it," said Haviland Tuf.

"Believe it," Rica said. "I don't sleep much, Tuf. Two or three hours a night. It's an asset in my profession."

"No doubt," said Tuf.

"On board ship, though, it's a bit of a liability. I'm bored, Tuf."

"A game, perhaps?"

She smiled. "Perhaps of a different sort."

"I am always eager to learn new games."

"Good. Let's play the conspiracy game."

"I am unfamiliar with its rules."

"Oh, they're simple enough."

"Indeed. Perhaps you would be good enough to elaborate." Tuf's long face was still and non-committal.

"You would never have won that last game if Waan had thrown in with me when I asked her to," Rica said conversationally. "Alliances, Tuf, can be profitable to all parties concerned. You and I are the odd ones out here. We're the hirelings. If Lion is right about the plague star, the rest of them will divide wealth so vast it's incomprehensible, and you and I will receive our fees. Doesn't seem quite fair to me."

"Equity is often difficult to judge, and still more difficult to achieve," said Haviland Tuf. "I might wish my compensation were more generous, but no doubt many could make the same complaint. It is nonetheless the fee that I negotiated and accepted."

"Negotiations can be reopened," suggested Rica Dawnstar. "They need us. Both of us. It occurred to me that if we worked together, we might be able to . . . ah . . . insist upon better terms. Full shares. A six-way split. What do you think?"

"An intriguing notion, with much to recommend it," said Tuf. "Some might venture to suggest that it was unethical, true, but the true sophisticate retains a certain moral flexibility."

Rica Dawnstar studied the long, white, expressionless face for a moment, and grinned. "You don't buy it, do you, Tuf? Down deep, you're a stickler for rules."

"Rules are the essence of games, the very heart of them, if you will. They give structure and meaning to our small contests."

"Sometimes it's more fun just to kick over the board," Rica Dawnstar said. "More effective, too."

Tuf steepled his hands in front of his face. "Though I am not content with my niggardly fee, nonetheless I must fulfill my contract with Kaj Nevis. I would not have him speak poorly of myself or the *Cornucopia of Excellent Goods at Low Prices*."

Rica laughed. "Oh, I doubt that he'll speak poorly of you, Tuf. I doubt that he'll speak of you at all, once you've served your purpose and he's discarded you." She was pleased to see that her statement startled Tuf into blinking.

"Indeed," he said.

"Aren't you curious about all this? About where we're going, and why Waan and Lion kept the destination secret until we were aboard? About why Lion hired a bodyguard?"

Haviland Tuf stroked Mushroom's long gray fur, but his eyes never left Rica Dawnstar's face. "Curiosity is my

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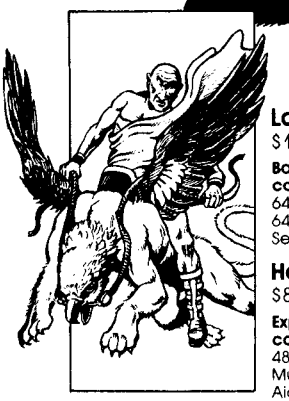

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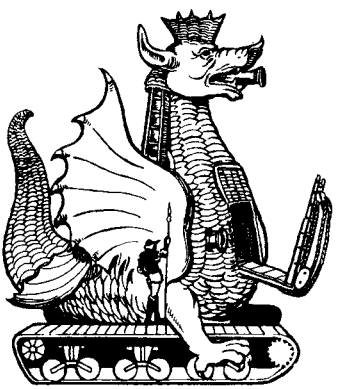

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great vice. I fear you have seen through to the heart of me, and now you seek to exploit my weakness."

"Curiosity killed the cat," said Rica Dawnstar.

"An unpleasant suggestion, but unlikely on the face of it," Tuf commented.

"But satisfaction brought him back," Rica finished. "Lion knows this is something huge. And hugely dangerous. To get what they want out of this, they needed Nevis, or somebody like Nevis. They have a nice four-way split set up, but Kaj has the kind of reputation makes you wonder if he'll settle for a fourth. I'm here to see that he does." She shrugged, and patted her needler in its shoulder holster. "Besides, I'm insurance against any other complications that might arise."

"Might I point out that you yourself constitute an additional complication?"

She smiled icily. "Just don't point it out to Lion," she said, rising, stretching. "You think about it, Tuf. The way I see it, Nevis has underestimated you. Don't you go underestimating him. Or me. Never, never, *never* underestimate me. The time may come when you'll wish you had an ally. And it may come sooner than you'd like."

Three days shy of arrival, Celise Waan was complaining again over dinner. Tuf had served a spiced vegetable brouhaha in the manner of Halagreen; a piquant dish, but for the fact that this was the sixth such serving on the voyage. The anthopologist shoved the vegetables around on her plate, made a face, and said, "Why can't we have some real food?"

Tuf paused, speared a fat mushroom deftly with his fork, lifted it in front of his face. He regarded it in silence for a moment, shifted the angle of his head and regarded it from another angle, turned it around and regarded that aspect of it, and finally prodded it lightly with his finger. "I fail to grasp the nature of your complaint, madam," he said at last. "This mushroom, at least, seems real enough to my own poor senses. True, it is but a small sample of the whole. Perhaps the rest of the brouhaha is illusory. Yet I think not."

"You know what I meant," Celise Waan said in a shrill tone. "I want meat."

"Indeed," said Haviland Tuf. "I myself want wealth beyond measure. Such fantasies are easily dreamed, and less easily made real."

"I'm tired of all these puling vegetables!" Celise Waan screeched. "Are you telling me that there is not a bit of meat to be had on this entire puling ship?"

Tuf made a steeple of his fingers. "It was not my intent to convey such misinformation, certainly," he said. "I am not an eater of flesh myself, but there is some small poor quantity of meat aboard the *Cornucopia of Excellent Goods at Low Prices*. This I freely admit."

A look of furious satisfaction crossed Celise Waan's face. She glanced at each of the other diners in turn. Rica Dawnstar was trying to suppress a grin; Kaj Nevis was not even trying; Jefri Lion was looking fretful. "You see," she told them, "I told you he was keeping the good food for himself." With all deliberation, she picked up her plate and

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spun it across the room. It rang off a metal bulkhead and dumped its load of spiced brouhaha on Rica Dawnstar's unmade bed. Rica smiled sweetly. "We just swapped bunks, Waan," she said.

"I don't care," Celise Waan said. "I'm going to get a decent meal for once. I suppose the rest of you will be wanting to share now."

Rica smiled. "Oh no, dear. It's all yours." She finished up her brouhaha, cleaned her plate with a crust of onion bread. Lion looked uncomfortable, and Kaj Nevis said, "If you can get this meat out of Tuf, it's all yours."

"Excellent!" she proclaimed. "Tuf, bring me this meat!"

Haviland Tuf regarded her impassively. "True, the contract I made with Kaj Nevis requires me to feed you though the duration of this voyage. Nothing was said about the nature of the provendar, however. Always I am put upon. Now I must cater to your culinary whims, it seems. Very well, such is my poor lot in life. And yet, now I find myself taken by a sudden whim of my own. If I must indulge your whim, would it not be equitable that you should similarly bend to mine?"

Waan frowned suspiciously. "What do you mean?"

Tuf spread his hands. "It is nothing, really. In return for the meat you crave, I ask only a moment's indulgence. I have grown most curious of late, and I would have that curiosity satisfied. Rica Dawnstar has warned me that unsatisfied curiosity will surely kill my cats."

"I'm for that," said the fat anthropologist.

"Indeed," said Tuf. "Nonetheless, I must insist. I offer you a trade; food, of the type you have requested so melodramatically, for a poor useless nugget of information, the surrender of which costs you nothing. We are shortly to arrive in the system of Hro B'rana, your chartered destination. I would know why we travel there, and the nature of what you expect to find, of this plague star of which I have heard you speak."

Celise Waan turned to the others again. "We paid good standards for food," she said. "This is extortion. Jefri, put your foot down!"

"Um," said Jefri Lion. "There's really no harm, Celise. He'll find out anyway, when we arrive. Perhaps it is time he knew."

"Nevis," she said, "aren't you going to do anything?"

"Why?" he demanded. "It doesn't makes a damn bit of difference. Tell him and get your meat. Or not. I don't care."

Waan glared at Kaj Nevis, and then even more fiercely at the cool pale face of Haviland Tuf, crossed her arms, and said, "All right, if that's the way it has to be, I'll sing for my supper."

"A normal speaking voice will be quite acceptable," said Tuf.

Celise Waan ignored him. "I'll make this short and sweet. The discovery of the plague star is my greatest triumph, the capstone of my career, but none of you have the wit or the courtesy to appreciate the work that went into it. I am an anthropologist with the ShanDellor Center for the Advancement of Culture and Knowledge. My academic specialty is the study of primitive cultures of a particular sort; cultures of colony worlds left to isolation and technological de-

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volution in the wake of the Great War. Of course, many human worlds were so affected, and a number of these have been studied extensively. I worked in less well-known fields, the investigation of nonhuman cultures, especially those of former Hrangan slaveworlds. One of the worlds I studied was Hro B'rana. Once it was a flourishing colony, a breeding ground for Hruun and dactyloids and lesser Hrangan slaveraces, but today it's a devastation. Such sentients that still live there live short, ugly, brutal lives, although like most such decayed cultures, they also have tales of a vanished golden age. But the most interesting thing about Hro B'rana is a legend, a legend unique to them—the plague star.

"Let me stress that the devastation on Hro B'rana is extreme, the underpopulation severe, despite the fact that the environment is not especially harsh. Why? Well, the degenerate descendents of both Hruun and dactyloid colonists, whose cultures are otherwise utterly different and very hostile to each other, have a common answer to that: the plague star. Every third generation, just as they are climbing out of their misery, as populations are swelling once again, the plague star waxes larger and larger in their nightime skies. And when this star becomes the brightest in the heavens, then the season of plagues begins. Pestilences sweep across Hro B'rana, each more terrible than the last. The healers are helpless. Crops wither, animals perish, and three-quarters of the sentient population die; those who survive are thrown back into the most brutal sort of existence. And the plague star wanes, and with its waning the plagues pass from Hro B'rana for another three generations. That is the legend."

Haviland Tuf's face had been expressionless as he listened to Celise Waan relate the tale. "Interesting," he said now. "I must surmise, however, that our present expedition has not been mounted simply to further your career by investigating this arresting folktale."

"No," Celise Waan admitted. "That was once my intent, yes. The legend seemed an excellent topic for a monograph. I was trying to get funding from the Center for a field investigation, but they'd turned down my request. I was annoyed, and justly so, those shortsighted fools. I mentioned my annoyance, and the cause, to my colleague, Jefri Lion."

Lion cleared his throat. "Yes," he said. "And my field, as you know, is military history. I was intrigued, of course. I buried myself in the Center databanks. Our files are not nearly as complete as those at Avalon and Newholme, but there wasn't time for a more thorough investigation. We had to act quickly. You see, my theory—well, it's more than theory, really—I believe, in fact I'm all but certain, that I know what this plague star is. It's no legend, Tuf! It's real. It must be a derelict, yes, abandoned but still operational, still carrying out its programs more than a millennia after the Collapse. Don't you see? Can't you guess?"

"I admit to failure," said Tuf, "lacking your familiarity with the subject at hand."

"It's a warship, Tuf, a warship in a long elliptical orbit around Hro B'rana. It's one of the most devastating weapons Old Earth ever put into the void against

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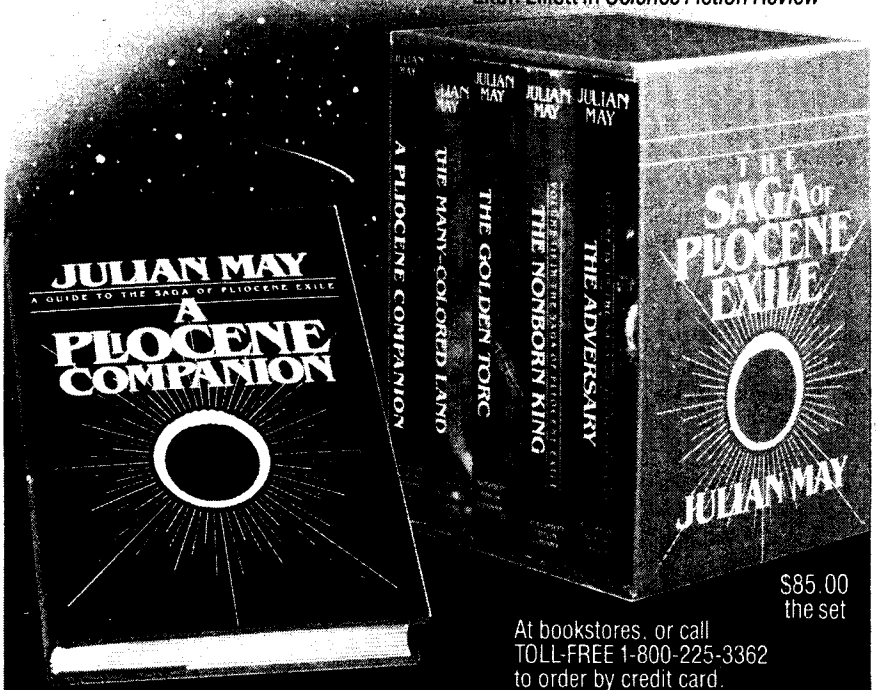

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the Hrangans, in its own way as terrible as that mythical hellfleet they talk about from those last days before the Collapse. But it has vast potential for good as well as ill! It's the repository of the most advanced biogenetic science of the Federal Empire, a functioning artifact packed full of secrets lost to the rest of humanity."

"Indeed," said Tuf.

"It's a seedship," Jefri Lion finished, "a biowar seedship of the Ecological Engineering Corps."

"And it's *ours,*" said Kaj Nevis, with a small grim smile.

Haviland Tuf studied Nevis briefly, nodded to himself, and rose. "My curiosity is satisfied," he announced. "Now I must fulfill my portion of the trade."

"Ahhh," said Celise Waan. "My meat."

"The supply is copious, though the variety is admittedly small," said Haviland Tuf. "I shall leave you the task of preparing the meat in a manner most pleasant to your palate." He went to a storage locker, punched in a code, and removed a small carton, which he carried back to the table under his arm. "This is the only meat aboard my vessel. I cannot vouch for its taste or quality. Yet I have not yet received a complaint on either count."

Rica Dawnstar burst into laughter and Kaj Nevis snickered. Haviland Tuf, neatly and methodically, removed a dozen cans of cat food from their carton, and stacked them in front of Celise Waan. Havoc leapt onto the table and began to purr.

"It's not as big as I expected," Celise Waan said, her tone as petulant as ever.

"Madam," said Haviland Tuf, "the eyes can often deceive. My main viewscreen is admittedly modest, a bare meter in diameter, and this must of course diminish the size of any object displayed thereon. The ship itself is of sizeable dimensions."

Kaj Nevis came forward. "How sizeable?"

Tuf folded his hands together atop the bulge of his stomach. "I cannot say with any precision. The *Cornucopia of Excellent Goods at Low Prices* is but a modest trading vessel, and its sensory instrumentation is not all that it might be."

"Approximately, then," Kaj Nevis snapped.

"Approximately," Tuf repeated. "Regarded at the angle at which my viewscreen is now displaying it, with the longest axis taken as 'length,' the ship we are approaching would seem to be, approximately, some thirty standard kilometers long, approximately some five kilometers in width, approximately some three kilometers in height, but for the domed section amidships, which rises slightly higher, and the forward tower which ascends, approximately, one additional kilometer above the deck from which it rises."

They had all gathered in the control room, even Anittas, who had been awakened from his computer-regulated sleep when they emerged from drive. A hush fell over them; even Celise Waan seemed briefly at a loss for something to say. All of them stared at the viewscreen, at the long black twisted shape that floated against the stars, here and there shining with faint lights and pulsing with unseen energies.

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"I was right," Jefri Lion muttered at last, to break the silence. "A seedship, an EEC seedship! Nothing else could possibly be so large!"

Kaj Nevis smiled. "Damn," he said.

"The system must be vast," Anittas said speculatively. "The Earth Imperials had a sophistication far beyond ours. It's probably an Artifical Intelligence."

"We're rich," burbled Celise Waan, her many and varied grievances forgotten for the moment. She grabbed hold of Jefri Lion's hands and waltzed him around in a circle, fairly bouncing. "We're rich, rich, we're rich and *famous*, we're all rich!"

"This is not entirely correct," said Haviland Tuf. "I do not doubt that you may indeed become wealthy in the near future; for the moment, however, your pockets contain no more standards than they did a moment ago. Nor do Rica Dawnstar and I share your prospects of economic advancement."

Nevis stared at him hard. "Are you complaining, Tuf?"

"Far be it from me to object," Tuf said in a flat voice. "I was merely correcting Celise Waan's misstatement."

Kaj Nevis nodded. "Good," he said. "Now, before any of us get any richer, we have to get aboard that thing and see what kind of shape it's in. Even a derelict ought to net us a nice salvage fee, but if that ship's in working order, there's no limit, no limit at all."

"It is obviously functional," Jefri Lion said. "It has been raining plagues on Hro B'rana every third generation for a thousand standard years."

"Yeah," said Nevis, "well, that's true, but it's not the whole story. It's dead in orbit now. What about the drive engines? The cell library? The computers? We've got a lot to check. How do we get aboard, Lion?"

"A docking might be possible," Jefri Lion replied. "Tuf, that dome, do you see it?" He pointed.

"My vision is unimpaired."

"Yes, well, I believe that's a landing deck under there. As big as a spacefield. If we can get the dome to open, you can take your ship right in."

"If," said Haviland Tuf. "A most difficult word. So short, and so often fraught with disappointment and frustration." As if to underline his words, a small red light came on beneath the main viewscreen. Tuf held up a long pale finger. "Take note!" he said.

"What is it?" asked Nevis.

"A communication," Tuf proclaimed. He leaned forward and touched a much worn button on his lasercom.

The plague star vanished from the screen. In its place appeared a weary-looking face; a man of middle years, sitting in a communications room. He had deep lines in his forehead and graven down his cheeks, a full head of thick black hair, and tired blue-gray eyes. But he was wearing a uniform out of a history tape, and on his head was a green billed cap emblazoned with a golden theta. "This is *Ark*," he announced. "You have entered our defense sphere. Identify yourself or be fired upon. This is your first warning."

Haviland Tuf held down his SEND button. "This is the *Cornucopia of Excellent Goods at Low Prices*," he annunciated clearly, "Haviland Tuf commanding. We are harmless unarmed traders out of ShanDellor, *Ark*. Might

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we request permission to approach for docking?''

Celise Waan gaped. ''It's manned,'' she said. ''The crew is still alive!''

''A fascinating development,'' Jefri Lion said, tugging at his beard. ''Perhaps this is a descendant of the original EEC crew. Or perhaps the stasis field was employed! To warp the very fabric of the weave of time, to hurry it or hold it still, yes, they could do even that. The stasis field! Think of it!''

Kaj Nevis made a snarling sound. ''A thousand damn years and you tell me they're still alive? How the hell are we supposed to deal with that?''

The image on the viewscreen flickered briefly. Then the same tired man in the uniform of the Earth Imperials said, ''This is *Ark*. Your ID is improperly coded. You are moving through our defense sphere. Identify yourself or be fired upon. This is your second warning.''

''Sir,'' said Haviland Tuf, ''I must protest! We are unarmed and unprotected. We mean you no harm. We are peaceful traders, scholars, fellow humans. Our intentions are not hostile, and moreover we lack any means of doing harm to a ship as formidable as your *Ark*. Must we be met with belligerence?''

The screen flickered. ''This is *Ark*. You have penetrated our defense sphere. Identify yourself immediately or be destroyed. This is your third and final warning.''

''Recordings,'' said Kaj Nevis, with some enthusiasm. ''that's it! No cold storage, no damned stasis field. There's no one there. Some computer is playing recordings at us.''

''I fear you are correct,'' said Haviland Tuf. ''The question must be asked: if the computer is programmed to play recorded messages at incoming ships, what else might it be programmed to do?''

Jefri Lion broke in. ''The codes!'' he said. ''I have a whole set of Federal Empire codes and ID sequences on crystal chips! In my files. I'll go get them.''

''An excellent plan,'' said Haviland Tuf, ''with but a single obvious deficiency, that being the time it will require to locate and utilize these encoded chips. Had we the leisure to accomplish this, I might applaud your suggestion. I fear we do not, alas. The *Ark* has just fired upon us.''

Haviland Tuf reached forward. ''I am taking us into drive,'' he announced. But suddenly, as his long pale fingers brushed the keys, the *Cornucopia* shook violently. Celise Waan shrieked and went down; Jefri Lion stumbled into Anittas; even Rica Dawnstar had to grab the back of Tuf's chair to retain her footing. Then all the lights went out. Haviland Tuf's voice came out of the dark. ''I fear I spoke too soon,'' he said, ''or perhaps, more accurately, acted too tardily.''

For a long moment, they were lost in silence and darkness and dread, waiting for the second hit that would spell an end to them.

And then the blackness ebbed a little; dim lights woke on all the consoles around them, as the *Cornucopia*'s instrumentation woke to a flickering half-life. ''We are not entirely disabled,'' Haviland Tuf proclaimed from the command chair where he sat stiffly. His big

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hands stretched out over the computer keys. "I will get a damage report. Perhaps we shall be able to retreat after all."

Celise Waan began to make a noise: a high, thin, hysterical wailing that went on and on. She was still sprawled on the deck. Kaj Nevis turned on her. "Shut up, you damned cow!" he snapped, and he kicked her. Her wail turned into blubbering. "We're dead meat sitting here like this," Nevis said loudly. "The next shot will blow us to pieces. Damn it, Tuf, move this thing!"

"Our motion is undiminished," Tuf replied. "The hit we took did not terminate our velocity, yet it did deflect us somewhat from our previous trajectory toward the *Ark*. Perhaps that is why we are not being fired upon now." He was studying wan green figures that uncoiled across one of the smaller telescreens. "I fear my ship has suffered some incapacitation. Shifting into drive now would be inadvisable; the stress would undoubtedly rend us to pieces. Our life support systems have also taken damage. The projections indicate that we will run out of oxygen in approximately nine standard hours."

Kaj Nevis cursed; Celise Waan began to beat her fists on the deck. "I can conserve oxygen by shutting down once more," Anittas offered. Everyone ignored him.

"We can kill the cats," Celise Waan suggested.

"Can we move?" Rica Dawnstar asked.

"The manueuvering engines are still operable," Tuf said, "but without the ability to shunt into stardrive, it will take us approximnately two ShanDish years to reach even Hro B'rana. Four of us can take refuge in pressure suits. The viral airpacs will recycle oxygen indefinitely."

"I refuse to live in a pressure suit for two years," Celise Waan said forcefully.

"Excellent," said Tuf. "As I have only four suits, and we are six in number, this will be of help. Your noble self-sacrifice will be long remembered, madam. Before we put this plan into motion, however, I believe we might consider one other option."

"And what's that?" Nevis asked.

Tuf swiveled about in his command chair and looked at each of them in the dimness of the darkened control room. "We must hope that Jefri Lion's crystalline chip does indeed contain the proper approach code, so that we might affect a docking with the *Ark* without being made the target of ancient weaponry."

"The chip!" Lion said. It was hard to see him. In the darkness, his chameleon cloth jacket had turned a deep black. "I'll go get it!" He went rushing back toward their living quarters.

Mushroom padded quietly across the room, and leapt up into Tuf's lap. Tuf settled a hand on him, and the big tom began to purr loudly. It was somehow a reassuring sound. Perhaps they would be all right after all.

But Jefri Lion was gone for too long a time.

When they finally heard him return, his footsteps were leaden, defeated.

"Well?" Nevis said. "Where is it?"

"Gone," Lion said. "I looked everywhere. It's gone. I could have sworn I had it with me. My files—Kaj, truly,

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I meant to bring it along. I couldn't bring everything, of course, but I duplicated most of the important records, the things I thought might prove useful. Material on the war, on the EEC, some histories of this sector. My gray case, you know, it had my little computer, and more than thirty crystal chips. I was going over some of them last night, remember, in bed? I was reviewing the material about the seedships, what little we know, and you told me that I was keeping you awake. I had a chip full of old codes, I know I did, and I really meant to bring it along. But it's not there." He came closer. They saw he was carrying the hand computer, holding it out almost as an offering. "I went through the box four times, and searched all the chips I had out on my bed, on the table, everywhere. It's not here. I'm sorry. Unless one of you took it?" Jefri Lion glanced about the room. No one spoke. "I, I," he said. "I must have left the codes back on ShanDellor. We were in such haste to leave, I, I, I . . ."

"You senile old fool," said Kaj Nevis. "I ought to kill you right now, and save a little air for the rest of us."

"We're dead," wailed Celise Waan, "we're dead, dead, dead."

"Madam," said Haviland Tuf, petting Mushroom, "you continue to be premature. You are no more deceased now than you were wealthy a short time ago."

Nevis turned to face him. "Oh? You have an idea, Tuf?"

"Indeed," said Haviland Tuf.

"Well?" prompted Nevis.

"The *Ark* is our only salvation," Tuf said. "We must board her. Without Jefri Lion's code crystal, we cannot move the *Cornucopia of Excellent Goods at Low Prices* closer for a docking, for fear of being fired upon once again. This much is obvious. Yet an interesting concept has occured to me." He raised a finger. "Perhaps the *Ark* might display less hostility toward a smaller target! A man in a pressure suit, say, propelled by air jets!"

Kaj Nevis looked thoughtful. "And when this man reaches the *Ark*, what then? Is he supposed to knock on the hull?"

"Impractical," admitted Haviland Tuf, "and yet I believe I have a method of dealing with this problem as well."

They waited. Tuf stroked Mushroom. "Go on," Kaj Nevis said impatiently.

Tuf blinked. "Go on? Indeed. I fear I must beg your indulgence. My mind is most distracted. My poor ship has suffered grievous harm. My modest livelihood lies ruined and devastated, and who will pay for the necessary repairs? Will Kaj Nevis, soon to enjoy such wealth, shower me with largesse? I fear not. Will Jefri Lion and Anittas buy for me a new ship? Unlikely. Will the esteemed Celise Waan grant me a bonus above and beyond my fee to compensate for my great loss? Yet she has already promised to seek legal redress against me, to have my poor vessel confiscated and my landing license revoked. How then am I to cope? Who will succor me?"

"Never mind about that!" Kaj Nevis said. "How do we get inside the Ark? You said you had a way!"

"Did I?" said Haviland Tuf. "I believe you are correct, sir. Yet I fear the weight of my woes has driven the concept from my poor, distracted mind. I

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have forgotten it. I can think of nothing but my sorry economic plight."

Rica Dawnstar laughed, and clapped Tuf soundly across his broad back.

He looked up at her. "And now I am roughly pummeled and beaten as well, by the fierce Rica Dawnstar. Please do not touch me, madam."

"This is blackmail," screeched Celise Waan. "We'll have you put in prison for this!"

"And now my integrity is impugned, and I am showered with threats. Is it any wonder I cannot think, Mushroom?"

Kaj Nevis snarled. "All right, Tuf. You win." He looked around. "Do I hear any objections to making Tuffy here a full partner? A five-way split?"

Jefri Lion cleared his throat. "He deserves at least that, if his plan works."

Nevis nodded. "You're in, Tuf."

Haviland Tuf rose with immense, ponderous dignity, brushing Mushroom from his lap. "My memory returns to me!" he announced. "There are four pressure suits in the locker, yonder. If one of you would so kind as to don one and render me your aid, together we shall go to procure a most useful piece of equipment from storage compartment twelve."

"What the hell," Rica Dawnstar exclaimed when they came back, carrying their booty between them. She laughed.

"What is it?" demanded Celise Waan.

Haviland Tuf, who loomed large in his silver-blue pressure suit, lowered the legs to the ground and helped Kaj Nevis get it upright. Then he removed his helmet and inspected their prize with satisfaction. "It is a spacesuit, madam," he said. "I would think that obvious."

It *was* a spacesuit, of sorts, but it was like no suit any of them had ever seen before, and clearly whoever had constructed it had not had humans in mind. It towered over all of them, even Tuf; the ornate crest on the great beetling helmet was a good three meters off the deck, and almost brushed the top of the bulkhead. There were four thick double-jointed arms, the bottom two ending in gleaming, serrated pincers; the legs were broad enough to contain the trunks of small trees, and the footpads were great circular saucers. On the broad, hunched back were mounted four huge tanks; a radar antenna sprang from the right shoulder; and everywhere the rigid black metal of which it was constructed was filigreed in strange swirling patterns of red and gold. It stood among them like an armored giant of old.

Kaj Nevis jerked a thumb at the armor. "It's here," he said. "So what? How will this monstrosity help us?" He shook his head. "It looks like a piece of junk to me."

"Please," said Tuf. "This mechanism, which you so disparage, is an antique rich with history. I acquired this fascinating alien artifact, at no small cost to myself, on Unqi when I passed through that sector. This is a genuine Unquin battlesuit, sir, represented to be of the Hameriin dynasty, which fell some fifteen hundred years ago, long before humanity reached the Unquish stars. It has been fully restored."

"What does it *do*, Tuf?" asked Rica Dawnstar, always quick to come to the point.

Tuf blinked. "Its capabilities are

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many and varied. Two strike closest to home in regard to our present quandry. It has an augmented exoskeleton, and when fully charged will magnify the inherent strength of its occupant by a power of ten, approximately. Furthermore, its equipment includes a cutting laser, engineered to slice through duralloy of a thickness of one-half meter, or of plate steel of significantly greater thickness, when directly applied at zero range. In brief, this ancient battlesuit will be our means of entry into the ancient warship that looms as our only salvation."

"Splendid!" said Jefri Lion, clapping his hands together in approval.

"It might work at that," Kaj Nevis commented. "What's the drill?"

I must admit to some deficiency of equipment for deep space manuevering," Tuf replied. "Our resources include four standard pressure suits, but only two jetpacs. The Unquin battlesuit, I am pleased to report, has its own propulsion vents. I propose the following plan. I will don the battlesuit and make egress from the *Cornucopia of Excellent Goods at Low Prices* accompanied by Rica Dawnstar and Anittas in pressure suits and jetpacs. We will procede to the *Ark* with all due speed. If we make the journey safely, we will use the battlesuit's most excellent capabilities to gain entrance through an airlock. I am told that Anittas is expert in ancient cybernetic systems and obsolete computers. Very well, then. Once inside, he will no doubt have little trouble gaining control of the *Ark* and will supersede the hostile programming now in place. At that point, Kaj Nevis will be able to pilot my crippled ship in for a docking, and all of us will have attained safety."

Celise Waan turned a vivid shade of red. "You're leaving us to die!" she screeched. "Nevis, Lion, we must stop them! Once they're on the *Ark*, they'll blow us up! We can't trust them."

Haviland Tuf blinked. "Why must my morality be constantly assaulted by these accusations?" he asked. "I am a man of honor. The course of action you have suggested had never crossed my mind."

"It's a good plan," said Kaj Nevis. He smiled, and began to unseal his pressure suit. "Anittas, hireling, suit up."

"Are you going to let them abandon us here?" Celise Waan demanded of Jefri Lion.

"I'm sure they mean us no harm," Lion said, tugging on his beard, "and if they did, Celise, how do you propose I stop them?"

"Let us move the battlesuit down to the main air lock," Haviland Tuf said to Kaj Nevis while Dawnstar and the cybertech were suiting up. Nevis nodded, kicked his way free of his own pressure suit, and moved to help Tuf.

With some difficulty, they wrestled the huge Unquish suit down to the *Cornucopia*'s main lock. Tuf shed his pressure suit and unbolted the armored entry port. He pulled over a stepstool and began to climb laboriously inside. "Just a moment, Tuffy," Kaj Nevis said, grabbing him by a shoulder.

"Sir," said Haviland Tuf, "I do not like to be touched. Unhand me." He turned back and blinked in surprise. Kaj Nevis had produced a vibroknife. The slender, humming blade, which could slice through solid steel, was a blur of

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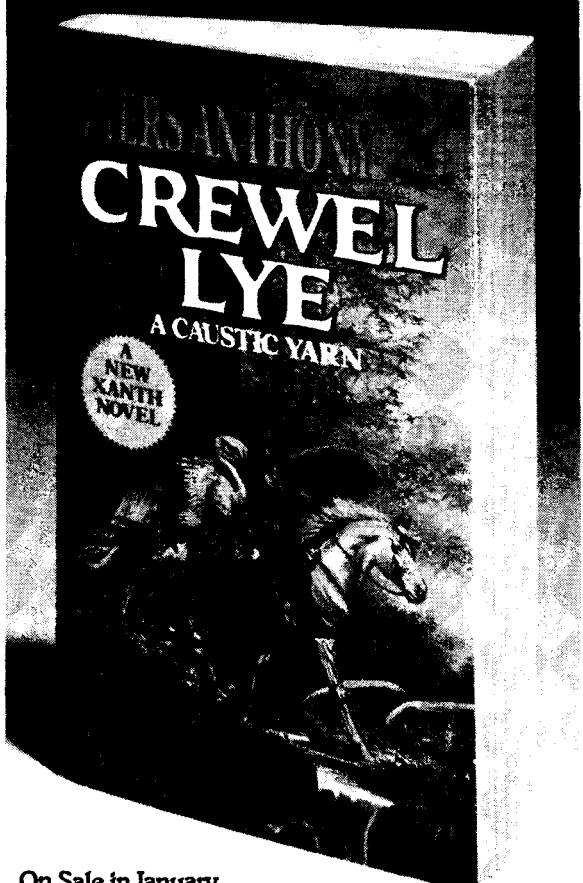

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motion less than a centimeter from Tuf's nose.

"A good plan," Kaj Nevis said, "but let's make one little change. I'll wear the supersuit, and go with Anittas and little Rica. You stay here and die."

"I do not approve of this substitution," said Haviland Tuf. "I am chagrined that you too would truckle to unfounded suspicion of my motives. I assure you, as I have assured Celise Waan, that thought of treachery has never crossed my mind."

"Funny," said Kaj Nevis. "It crossed *my* mind. Seemed like a damn fine idea, too."

Haviland Tuf assumed a look of wounded dignity. "Your base plans are undone, sir," he announced. "Anittas and Rica Dawnstar have come up behind you. It is well known that Rica Dawnstar was hired to forestall just such behavior from you. I advise you to surrender now. It will go easier on you."

Kaj Nevis grinned.

Rica had her helmet cradled under her arm. She observed the tableau, shook her pretty head slightly, and sighed. "You should have taken my offer, Tuf. I told you the time would come when you'd be sorry you didn't have an ally." She donned the helmet, sealed it, scooped up an airjet. "Let's go, Nevis."

Comprehension finally dawned on the broad face of Celise Waan. To her credit, this time she did not succumb to hysteria. She looked about for a weapon, found nothing obvious, and finally grabbed Mushroom, who was standing nearby and watching events with curiosity. "You, you, YOU!" she shouted, heaving the cat across the room. Kaj Nevis ducked. Mushroom yowled mightily and bounced off Anittas.

"Kindly cease flinging about my cats," Haviland Tuf said. Nevis, recovering quickly, brandished the vibroknife at Tuf in a most unpleasant fashion, and Tuf backed slowly away. Nevis paused long enough to scoop up Tuf's discarded pressure suit and slice it deftly into a dozen long silver-blue ribbons. Then, carefully, he climbed into the Unquin battlesuit. Rica Dawnstar sealed it up after him. It took Nevis some time to figure out the alien control systems, but after about five minutes the bulging faceplate began to glow a baleful blood red, and the heavy upper limbs moved ponderously. He switched to the lower, pincered arms experimentally while Anittas opened the inner door of the lock. Kaj Nevis lumbered in, clacking his pincers, followed by the cybertech and, lastly, Rica Dawnstar. "Sorry, folks," she announced as the door was sliding shut. "It's nothing personal. Just arithmetic."

"Indeed," said Haviland Tuf. "Subtraction."

Haviland Tuf sat in his command chair, enthroned in darkness, watching the flickering instrumentation before him. Mushroom, his dignity much offended, had settled in Tuf's lap and was graciously allowing himself to be soothed. "The *Ark* is not firing on our erstwhile compatriots," he told Jefri Lion and Celise Waan.

"This is all my fault," Jefri Lion was saying.

"No," said Celise Waan, "It's *his* fault." She jerked a fat thumb toward Tuf.

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"You are not the most appreciative of women," Haviland Tuf observed.

"Appreciative? What am I supposed to appreciate?" she said angrily.

Tuf made a steeple of his hands. "We are not without resources. To begin with, Kaj Nevis left us one functioning pressure suit," he pointed out.

"And no propulsion systems."

"Our air will last twice as long with our numbers diminished," Tuf said.

"But will still run out," snapped Celise Waan.

"Kaj Nevis and his cohorts did not use the Urquin battlesuit to destroy the *Cornucopia of Excellent Good at Low Prices* after their exit, as well they might have."

"Nevis preferred to see us die a lingering death," the anthropologist replied.

"I think not. More likely, in point of fact, he wished to preserve this vessel as a last refuge should his plan to board the *Ark* somehow miscarry," Tuf mused. "In the nonce, we have shelter, provisions, and the possibility of maneuver, however limited."

"What we have is a crippled ship that is rapidly running out of air," said Celise Waan. She started to say something else, but just then Havoc came bounding into the control room, all energy and bounce, in hot pursuit of a bit of jewelry she'd sent rolling in before her. It landed by Celise Waan's feet; Havoc pounced on it, and sent it spinning with a tentative swipe. Celise Waan yelped. "My glowstone ring! I've been looking for that! Damn you, you filthy thief." She bent and snatched for the ring. Havoc closed with her, and she gave the cat a lusty blow with her fist. She missed. Havoc's claws were more accurate. Celise Waan shrieked.

Haviland Tuf was on his feet. He snatched up cat and ring, tucked Havoc safely under his arm, and handed the ring stiffly to its bleeding owner. "Your property," he said.

"Before I die, I swear I'm going to grab that creature by the tail and smash its brains on a bulkhead. If it has any brains."

"You do not sufficiently appreciate the virtues of the feline," said Tuf, retreating to his chair. He soothed Havoc's feelings as he had earlier soothed Mushroom. "Cats are most intelligent animals. In fact, it is well known that all cats have a touch of psi. The primitives of Old Earth were known to worship them."

"I've studied primitives who worship fecal matter," the anthropologist said testily. "That animal is a filthy beast!"

"The feline is fastidiously clean," Tuf said calmly. "Havoc herself is scarcely more than a kitten, and her playfulness and chaotic temperament remain undiminished," he said. "She is a most willful creature, and yet, that is but part of her charm. Curiously, she is also a creature of habit. Who could fail to be warmed by the joy she takes in play with small objects left lying about? Who could fail to be amused by the foolish frequency with which she loses her playthings beneath the consoles in this very room? Who indeed. Only the most sour and stony-hearted." Tuf blinked rapidly; once, twice, three times. On his long still face, it was a thunderstorm of emotion. "Off, Havoc," he said, gently swatting the cat from his lap. He rose, then sank to his knees with

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a stiff dignity. On hands and knees, Haviland Tuf began to crawl about the room and feel beneath the control consoles.

"What are you doing?" demanded Celise Waan.

"I am searching for Havoc's lost toys," said Haviland Tuf.

"I'm bleeding and we're running out of air and you're looking for *cat toys!*" she said in exasperation.

"I believe I have just stated as much," Tuf said. He pulled a handful of small objects out from under the console, and then a second handful. After thrusting his arm all the way back and patting about systematically, he finally gave up, gathered his cache, dusted himself off, and began to sort the prizes from the dust. "Interesting," he said.

"What?" she demanded.

"These are yours," he said to Celise Waan. He handed her another ring and two light pencils. "These are mine," he said, shoving aside two more light pencils, three red cruisers, a yellow dreadnaught, and a silver star-fort. "And this, I believe, is yours." He held it out to Jefri Lion: a shaped crystal the size of a thumbnail.

Lion all but bounded to his feet. "The chip!"

"Indeed," said Haviland Tuf.

There was a moment of endless suspense after Tuf had lasered the docking request. A thin crack appeared in the middle of the great black dome. And then another, at cross angles to the first. Then a third, a fourth, more and still more. The dome split into a hundred narrow pie-shaped wedges, which receded into the hull of the *Ark*.

Jefri Lion let go of his breath. "It works," he said, in a voice full of awe and gratitude.

"I reached that conclusion some time ago," Tuf said, "when we successfully penetrated the defense sphere without being fired upon. This is merely a confirmation."

They watched the proceedings on the viewscreen. Beneath the dome appeared a landing deck fully as large as the ports of many a lesser planet. The deck was pockmarked with circular landing pads, several of which were occupied. As they waited, a ring of blue-white light flicked on around one vacant pad.

"Far be it from me to dictate your behavior," said Haviland Tuf, his eyes on his instruments, his hands in careful, methodical motion. "I would, however, advise that each of you strap in securely. I am extending the landing legs and programming us for a landing on the indicated pad, but I am uncertain how much damage the legs have sustained, uncertain even as to whether all three legs remain in place. Therefore I counsel caution."

The landing deck yawned blackly beneath them. They began a stately descent into its cavernous depths. The illuminated ring of the landing pad loomed larger and larger on one viewscreen; a second showed the wan blue light of the *Cornucopia*'s gravity engines flickering off distant metal walls and the silhouettes of other ships; in a third, they saw the dome reassembling itself, a dozen sharp teeth grinding together once more, as if they had just been swallowed by some vast spacefaring animal.

The impact was surprisingly gentle. They settled into place with a sigh and

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a whisper and only the smallest of bumps. Haviland Tuf killed their engines, and spent a moment studying the instruments and the scenes on his telescreens. Then he turned to face the others. "We are docked," he announced, "and the time has come to make our plans."

Celise Waan was busily unstrapping herself. "I want to get out of here," she said, "find Nevis and that bitch Rica and give them both a good piece of my mind."

"A good piece of your mind might be considered an oxymoron," said Haviland Tuf. "I think your proposed course of action unwise in the extreme. Our former colleagues must now be considered our rivals. Having just abandoned us to death, they shall undoubtedly be nonplussed to discover us still alive, and might very well take steps to rectify this contradiction."

"Tuf is right," Jefri Lion said. He was moving from one screen to another, peering at them with fascination; the ancient seedship had rekindled his spirit and his imagination, and he was bristly with energy. "It's us against them, Celise. This is war. They'll kill us if they can, have no doubt of it. We must be similarly ruthless! This is a time for clever tactics."

"I bow to your martial expertise," Tuf said. "What strategies do you suggest?"

Jefri Lion tugged on his beard. "Well," he said, "well, let me think. What's the situation here? They have Anittas. The man's half-computer himself. Once he interfaces with the shipboard systems, he should be able to determine how much of the *Ark* is functional, yes, and perhaps to exercise some control over its functioning too. That could be dangerous. He might be trying it right now. We know they got aboard first. They may or may not know we're aboard. We have the advantage of surprise, perhaps!"

"They have the advantage of having all the weaponry," said Haviland Tuf.

"No problem!" said Jefri Lion. He rubbed his hands together eagerly. "This is a warship, after all. The EEC specialized in biowar, true, but this was a military vessel and I'm sure the crew had personal sidearms, that sort of thing. There's got to be an armory. All we have to do is find it."

"Indeed," said Haviland Tuf.

Lion was rolling now. "Our advantage, well, not to be immodest about it, but our advantage is me. Aside from what Anittas can discover from the computers, they'll be blundering about in the dark. But I've studied the old Federal Empire ships. I know everything about them." He frowned. "Well, everything that wasn't lost or classified, anyway. At least I know a few things about the general plans of these seedships. We'll have to find the armory first, and it should be close. It was standard procedure to store weaponry near the landing deck, for ground parties and such. After we're armed, we ought to look for—hm-m-m, let me think—well, yes, the cell library, that's crucial. The seedships had vast cell libraries, cloning material from literally thousands of worlds preserved in a stasis field. We must discover if the cells are still viable! If the stasis field has failed and the samples have decayed, all we have gained is a very large ship. But if

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the systems are still operational, the *Ark* is literally priceless!"

"While I appreciate the importance of the cell library," Tuf said, "it strikes me that a more immediate priority might be the location of the bridge. Making the perhaps unwarranted but nonetheless attractive assumption that none of the original crew of the *Ark* is alive after the passage of a millenium, we are then alone on this vessel with our enemies, and whichever party gains control of shipboard functions first will enjoy a rather formidable advantage."

"A good point, Tuf!" Lion exclaimed. "Well then, let's get to it."

"Right," said Celise Waan. "I want out of this cat trap."

Haviland Tuf raised a finger. "A moment, please. A problem presents itself. We are three in number, and possess only a single pressure suit among us."

"We're inside a *ship*," Celise Waan said in a voice that dripped sarcasm. "What do we need with suits?"

"Perhaps nothing," Tuf admitted. "It is true, as you imply, that the landing field seems to function as a very large airlock; my instruments indicate that we are now surrounded by an entirely breathable oxygen-nitrogen atmosphere, pumped in when the closure of the dome was complete."

"So what's the problem, Tuf?"

"No doubt I am being overcautious," Haviland Tuf said. "I admit to some disquiet, however. This *Ark*, though perhaps abandoned and derelict, is nonetheless dutiful. Witness the plagues it still regularly visits on Hro B'rana. Witness the efficiency with which it defended itself against our approach. We cannot know, as yet, why this ship was abandoned, nor how the last of the crew met their end, but it seems clear that it was their intent that the *Ark* live on. Perhaps the external defense sphere was only the first of several lines of automatic defense."

"An intriguing notion," said Jefri Lion. "Traps?"

"Of a particular kind. The atmosphere that awaits us may seethe with pestilence, plague, and biogenetic contagion. Dare we risk it? I would be more comfortable in a pressure suit, myself, though each of you is free to decide otherwise."

Celise Waan looked uncomfortable. "I should get the suit," she said. "We only have one, and you owe it to me, after the beastly way I've been treated."

"We need not enter into that discussion again, madam," said Tuf. "We are on a landing deck. Around us, I observe nine other spacecraft of varying design. One is a Hruun fighter, one a Rhiannese merchant; two are of designs unfamiliar to me. And five are plainly shuttlecraft of some sort, identical to each other, larger than my own poor vessel here, undoubtedly part of the *Ark*'s own original equipment. It is my experience that spacecraft invariably are equipped with pressure suits. It is my intention, therefore, to don our single remaining suit, exit, and search these neighboring ships until I have found suits for each of you."

"I don't like it," Celise Waan snapped. "You get out, and we're still stuck here."

"Such are the vicissitudes of life," Tuf said, "that each of us must some-

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times accept that which he does not like."

The airlock gave them a bit of trouble. It was a small emergency lock, with manual controls. They had no difficulty opening the outer door, entering, and sealing it behind them. The inner door was another and more difficult proposition.

Atmosphere came flooding back into the large chamber as soon as the outer door was closed, but the inner door was jammed somehow. Rica Dawnstar tried it first; the huge metal wheel refused to turn, the lever would not depress. "OUT OF MY WAY," Kaj Nevis said, his voice twisted into a rasping croak by the alien comm circuits built into the Unquin battlesuit, and boosted to deafening levels by external speakers. He trundled past her, the huge saucer feet ringing loudly on the deck, and the battle suit's great upper arms seized the wheel and turned. The wheel resisted for a moment, and then twisted and buckled, and finally came loose of the door entirely.

"Good work," Rica said over her suit speaker. She laughed.

Kaj Nevis growled something thunderously unintelligible. He seized the lever and tried to move it, and succeeded only in breaking it off.

Anittas moved closer to the stubborn inner lock mechanism. "A set of code buttons," he said, pointing. "The proper code sequence, if we knew it, would no doubt gain us entry automatically. There's a computer outlet too. If I could interface, perhaps I could pull the correct code out of the system."

"WHAT'S STOPPING YOU?" Kaj Nevis demanded. His faceplate glowed balefully.

Anittas lifted his arms, turned his hands over helplessly. With the more obviously organic portions of his body covered by the silver-blue of his pressure suit, and his silver metallic eyes peering out through the plastic, he looked more like robot than ever. Kaj Nevis, standing huge above him, looked like a much larger robot. "This suit," Anittas said, "is improperly designed. I cannot interface directly without removing it."

"REMOVE IT, THEN," Nevis said.

"Will that be safe?" asked Anittas. "I am unsure."

"There's air in here," Rica Dawnstar put in. She gestured toward the appropriate bank of indicators.

"Neither of you has removed your suit," Anittas pointed out. "Were I to make a mistake, and open the outer door instead of the inner one, I might die before I could seal up again."

"DON'T MAKE A MISTAKE," Kaj Nevis boomed.

Anittas crossed his arms. "The air might be unhealthy. This ship has been derelict for a thousand standard years, Kaj Nevis. Even the most sophisticated system goes down from time to time, experiences failures and glitches. I am unwilling to risk my person."

"OH?" Nevis thundered. There was a grinding sound. One of the lower arms came up slowly; the serrated metal pincer opened, seized Anittas about the middle, and pinned him against the nearest wall. The cybertech squawked protest. An upper arm came across, and a huge metal-cloved hand dug in under the collar of the pressure suit. It pulled.

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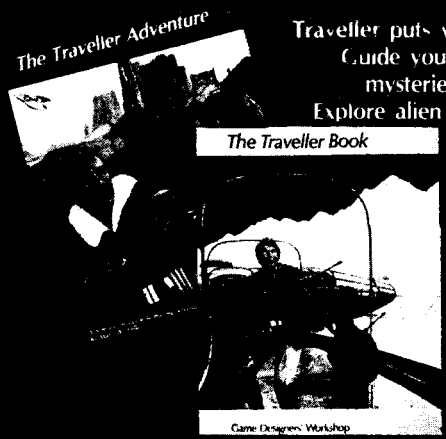

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The helmet and the entire top of the suit came ripping off Anittas. His head almost came off as well.

"I LIKE THIS SUIT," Kaj Nevis announced. Metal fabric tore and blood began oozing through. "YOU'RE BREATHING, AREN'T YOU?"

Anittas was almost hyperventilating, in fact. He nodded.

The battlesuit flung him to the floor. "THEN GET TO WORK," Nevis told him.

That was when Rica Dawnstar began to feel nervous. She backed away casually, leaned against the outer door as far from Nevis as she could get, and considered the situation while Anittas removed his gloves and the shards of his ruined suit and slid the bluesteel fingers of his right hand into the waiting computer plugs. She had strapped her shoulder holster on over her pressure suit, so her needler would be accessible, but suddenly its presence didn't seem entirely as reassuring as it usually did. She studied the thickness of the Unquin armor, and wondered if maybe she had been unwise in her choice of ally. A three-way split was much better than Jefri Lion's small fee, to be sure. But what if Nevis decided he didn't like a three-way split?

They heard a sharp, sudden *pop* and the inner door began to slide open. Beyond was a narrow corridor leading down into blackness. Kaj Nevis moved to the doorway and peered into the dark, his glowing red faceplate throwing scarlet reflections on the walls. Then he turned ponderously. "YOU, HIRELING!" he boomed at Rica Dawnstar, "GO SCOUT IT OUT."

She came to a decision. "Aye, aye, bossman," she said. She drew her needler, moved quickly to the door and down the corridor, followed it about ten meters to a cross-corridor. From there she looked back. Nevis, hugely armored, filled the airlock door. Anittas stood beside him. The cybertech, normally so silent, still, and efficient, was shaking. "Stay right there," Rica called back to them. "It's not safe!" Then she turned and picked a direction at random and began to run like hell.

It took Haviland Tuf much longer than he had anticipated to locate the suits. The nearest of the other spacecraft was the Hruun fighter, a chunky green machine bristling with weaponry. It was sealed up securely, however, and although Tuf circled it several times and studied the various instruments that seemed designed to command access, none of his tugging, prodding, pushing, or fiddling produced the desired result, and he was forced to give it up finally and proceed onward.

The second ship, one of the strange ones, was wide open, and he wandered through it with a certain amount of intellectual fascination; its interior was a maze of narrow corridors whose walls were as irregular and pebbly as a cave, and soft to the touch; its instruments were incomprehensible; its pressure suits, when he located what looked to be pressure suits, might have been functional, but could never have been worn by anyone over a meter tall or bilaterally symmetrical.

The Rhiannese merchant, his third try, had been gutted; Tuf could locate nothing useful.

Finally there was nothing to be done

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for it but to hike all the way to one of the five distant shuttlecraft that stood side-by-side, snug in custom launching berths. They were big ships, larger than the *Cornucopia of Excellent Goods at Low Prices*, with black pitted hulls and rakish wings, but they were clearly of human design and seemingly in good repair. Tuf finally puzzled his way into one of them, whose berth bore a metal plate with an engraved silhouette of some fanciful animal and a legend proclaiming it to be named *Griffin*. Pressure suits were located where they should have been located. They were in excellent shape, considering that they were a thousand years old, and quite striking as well: a deep green in color, with golden helmet and gloves and boots, and a golden theta emblazoned upon the breast of each. Tuf selected two of them and carried them back across the echoing twilight plain of the landing deck, to where the scarred, crippled teardrop that was his *Cornucopia* squatted on its three splayed legs.

When he got to the base of the ramp that led up to the main lock, he almost stumbled over Mushroom.

The big tom was sitting on the deck. He got up and made a plaintive noise, rubbing himself against Tuf's booted leg.

Haviland Tuf stopped for an instant and stared down at the old gray tom. He bent awkwardly, gathered up the cat, and stroked him for a time. When he climbed the ramp to the airlock, Mushroom followed, and Tuf found it necessary to shoo him away. He cycled through with a pressure suit under each arm.

"It's about time," Celise Waan said when Tuf entered.

"I told you Tuf hadn't abandoned us," Jefri Lion said.

Haviland Tuf let the pressure suits fall to the deck, where they lay like a puddle of green-and-gold. "Mushroom is outside," Tuf said in a flat, passionless voice.

"Well, yes," Celise Waan said. She grabbed a suit and began squeezing into the green metallic fabric. It bound her tightly about the middle; the members of the Ecological Engineering Corps had seemingly been less fleshy than she. "Couldn't you have gotten me a larger size?" she complained. "Are you sure these suits still work?"

"The construction seems sound," Tuf said. "It will be necessary to infuse the airpacs with whatever living bacteria remain from the ship's cultures. How did Mushroom come to be outside?"

Jefri Lion cleared his throat uncomfortably. "Uh, yes," he said. "Celise was afraid you weren't coming back, Tuf. You were gone so long. She thought you'd left us here."

"A base and foundless suspicion," said Tuf.

"Uh, yes," said Lion. He looked away, reached for his own suit.

Celise Waan pulled on a golden boot, sealed it. "It's your fault," she said to Tuf. "If you hadn't been gone so long, I wouldn't have gotten restless."

"Indeed," said Tuf. "What, might I venture to ask, has your restlessness to do with Mushroom?"

"Well, I thought you weren't coming back, and we had to get out of here," the anthropologist said. She sealed up her second boot. "But you made me

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nervous, you know, with all your talk of plagues. So I cycled the cat through the airlock. I tried to get that damned black-and-white one, but it kept running away and hissing at me. The gray one just let me pick it up. I dumped it out and we've been watching it through the screens. I figured we could see whether or not it got sick. If it didn't show any symptoms, well, then probably it would be safe for us to risk coming out."

"I grasp the principle," said Haviland Tuf.

Havoc came bounding in the room, playing with something. She saw Tuf and headed toward him, walking with pronounced kittenish swagger.

"Jefri Lion," said Tuf, "if you would, please apprehend Havoc, take her back to the living quarters, and confine her there."

"Uh, certainly," Lion said. He caught up Havoc as she went by him. "Why?"

"I would prefer henceforth to keep Havoc secure and separated from Celise Waan," Tuf said.

Celise Waan, helmet cradled under her arm, made a noise of derision. "Oh, stuff and nonsense. The gray one is fine."

"Permit me to mention a concept with which you are perhaps unfamiliar," said Haviland Tuf. "It is referred to as an incubation period."

"I'M GOING TO KILL THAT BITCH," Kaj Nevis threatened as he and Anittas made their way down a dark hallway. "DAMN HER. YOU CAN'T GET A DECENT MERCENARY ANYMORE." The battlesuit's huge head turned to search for the cybertech, the faceplate glowing. "HURRY UP."

"I cannot match your strides," Anittas said as he hurried up. His sides ached from the effort of keeping up with Nevis's pace; his cyberhalf was strong as metal and quick as electronic circuitry, but his biohalf was poor, tired wounded flesh, and blood still oozed from the cuts Nevis had opened around his midsection. He was feeling dizzy and hot, as well. "It's not far now," he said. "Down this corridor and to the left, third door. It is a substantial substation. I felt it when I was plugged in. I will be able to meld with the main system." And rest, he thought. He was incredibly weary, and his biohalf ached and throbbed.

"I WANT THE DAMN LIGHTS ON," Nevis commanded. "AND THEN I WANT YOU TO FIND HER FOR ME. DO YOU UNDERSTAND?"

Anittas nodded, and pushed himself harder. Two small hot pinpoints of red burned on his cheeks, unseen by his silver-metal eyes, and for an instant his vision blurred and wavered, and he heard a loud buzzing in his ears. He stopped.

"WHAT'S WRONG NOW?" Nevis demanded.

"I," Anittas said. "I am experiencing some loss of function. I must reach the computer room and run a check on my systems." He started forward again, and staggered. Then his balance deserted him totally, and he fell.

Rica Dawnstar was positive that she had lost them. Kaj Nevis was pretty formidable in his giant metal monkey suit, no doubt of that, but he was anything but silent. Rica had eyes like one of Tuf's cats, another advantage in her

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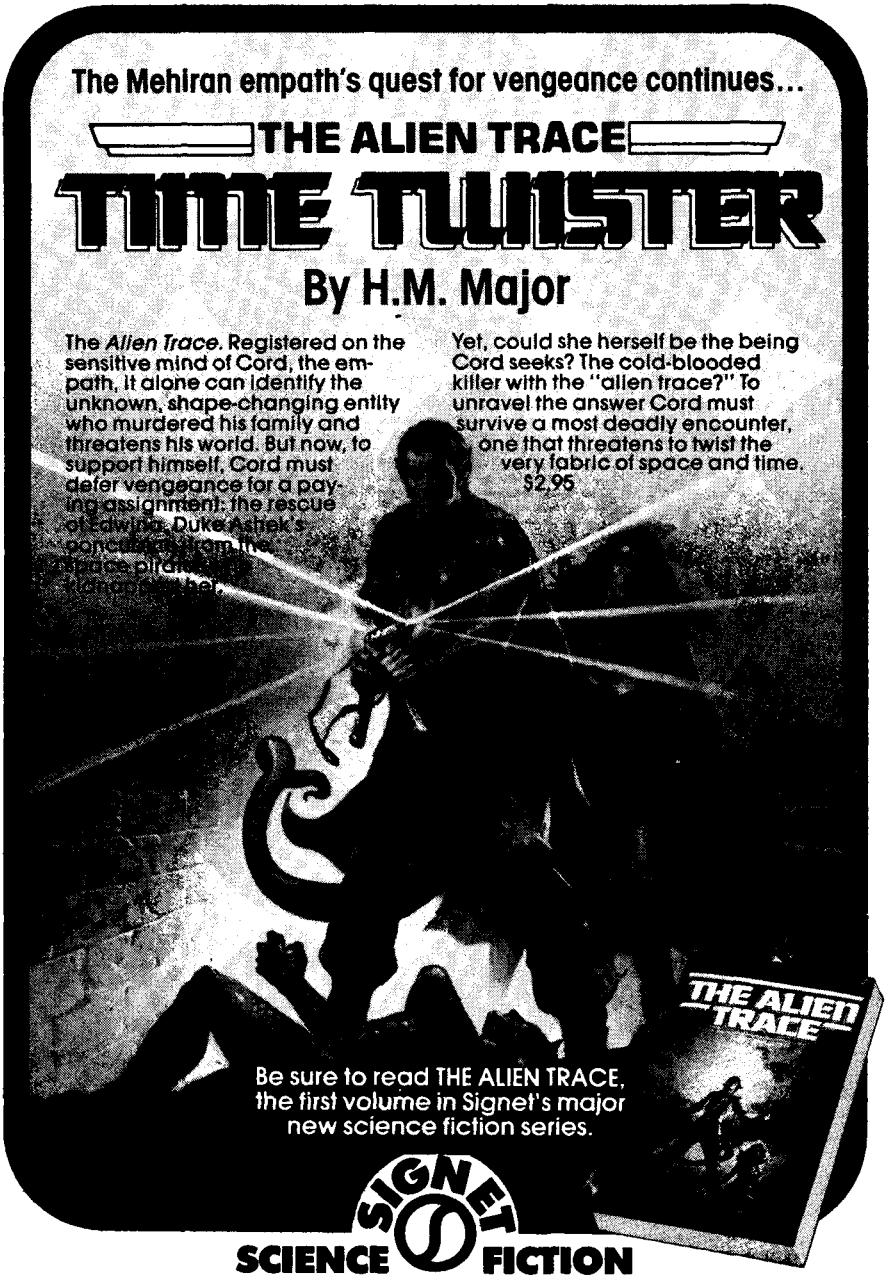

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profession. Where she could see, she ran; in the corridors that were totally black, she felt her way along, as quickly and quietly as she could. Down here the *Ark* was a maze of rooms and hallways. She threaded her way through the labyrinth, turning and twisting and turning once again, doubling back on herself, and listening carefully as Nevis's clanging tread grew steadily fainter and finally faded altogether.

Only then, when she knew she was safe, did Rica Dawnstar begin to explore the warren in which she found herself. There were light plates set in the walls; some responded to the touch of her hand, others did not. She lit her way wherever she could. The first section she passed through was residential; small sleeping rooms off narrow corridors, each with its bed and desk and computer console and telescreen. Some rooms were empty and sterile; in others she found beds unmade and clothing strewn across the floor. Everything was neat and clean. Either the residents had just moved out the night before, or the *Ark* had kept this whole portion of the ship sealed and inviolate and in repair, until their approach had somehow activated it.

The next section had not been so fortunate. Here the rooms were full of dust and debris, and in one she found an ancient skeleton, a woman, still asleep in a bed that had collapsed into shapeless decay centuries before. What a difference a little air can make, Rica thought.

The corridors led into other corridors, wider ones. She peered into storage rooms, into chambers full of equipment and other chambers packed with empty cages, into spotless white laboratories in endless succession that lined the sides of a corridor as wide as the boulevards of Shandicity. That led her, eventually, to a junction with an even grander corridor. She hesitated, unsure for a moment, and drew her needler. This way to the control room, she thought to herself. Or to something important, at any rate. She stepped out onto the main way, spotted something in the corner; dim shapes, hunched down into little niches in the wall. Cautiously, Rica moved toward them.

When she got close, she laughed and holstered her weapon. The dark shapes were a row of scooters of some kind; small three-wheeled vehicles, each with two seats and big soft balloon tires. They were set into charging-slots in the walls.

Rica pulled one out, swung herself lithely into the driver's seat, flicked on the power. The gauges registered a full charge. It even had a headlight, which cut through the dark and the shadows ahead quite nicely, thank you. Grinning, she rolled off down the broad corridor. She wasn't going very fast, but what the hell, at least she was getting there.

Jefri Lion led them to an armory. It was there that Haviland Tuf killed Mushroom.

Lion was flashing a hand-torch over the room in swift, excited arcs, exclaiming at the stockpile of laser rifles, projectile weapons, screechguns, and light-grenades. Celise Waan was complaining that she had no familiarity with weapons, and didn't think she could kill anybody anyway, she was a scientist

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and not soldier, after all, she thought all this was barbaric.

Haviland Tuf held Mushroom cradled in his arms. The big tomcat had purred loudly when Tuf had re-emerged from the *Cornucopia* and scooped him up, but no longer. Now he was making a pitiful sound, half mewing, half choking. When Tuf tried to stroke him, the long, soft gray fur came out in clumps. Mushroom screeched. Something was growing inside his mouth, Tuf saw; a web of fine black hairs crept from a black fungoid mass. Mushroom howled again, more loudly, and struggled to get free, wielding his claws uselessly against the metal of Tuf's suit. His big yellow eyes were covered with film.

The others had not noticed; their minds were on larger concerns than the cat that Tuf had voyaged with all his life. Jefri Lion and Celise Waan were arguing with each other. Tuf held Mushroom very still, despite the tom's struggles. He stroked him one last time and spoke soothingly to him. Then, in a single swift clean motion, he snapped the cat's neck.

"Nevis has already tried to kill us," Jefri Lion was saying to Celise Waan. "I don't care what your qualms are, really, you must do your part. You can't expect Tuf and I to carry the whole burden of our defense." Behind the thick plastic faceplate of his pressure suit, Lion frowned. "I wish I knew more about that battlesuit that Nevis is wearing," Lion said. "Tuf, will laser fire cut through that Unquin armor? Or would some kind of explosive projectile be more effective? A laser, I would think. Tuf?" He turned around, swinging the hand torch back and forth so shadows danced wildly against the chamber walls. "Tuf, where are you? Tuf?"

But Haviland Tuf was gone.

The door to the computer room refused to open. Kaj Nevis kicked it. The metal buckled inward in the center and the top of the door popped free of the frame. Nevis kicked it again, and again, his massive armored foot slamming with awful force against the thinner metal of the door. Then he shoved the crumpled remains of the barrier out of his way and entered, with Anittas cradled in his stiff lower arms. "I LIKE THIS DAMNED SUIT," he said. Anittas groaned.

The substation was filled with a thin subsonic humming, a buzz of anxiety. Tiny colored lights blinked on and off like firelies.

"In the circuit," Anittras said. His hand flailed about weakly in what could have been either a gesture or a spasm. "Get me in the circuit," he repeated. The parts of him that were still organic looked terrible. His skin was covered with beads of black sweat; tiny drops of moisture as shiny as liquid ebony oozed from every fleshy pore. Mucus ran freely from his nose, and he was bleeding from his single organic ear. He couldn't stand or walk and his speech seemed to be deteriorating as well. The dull red glow from the battlesuit's helmet gave him a deep crimson caul that made him look even worse. "Hurry," he told Nevis, "the circuit, please, get me in the circuit."

"SHUT UP OR I'LL DUMP YOU HERE," Nevis answered. Anittas shuddered, as if the magnified volume of

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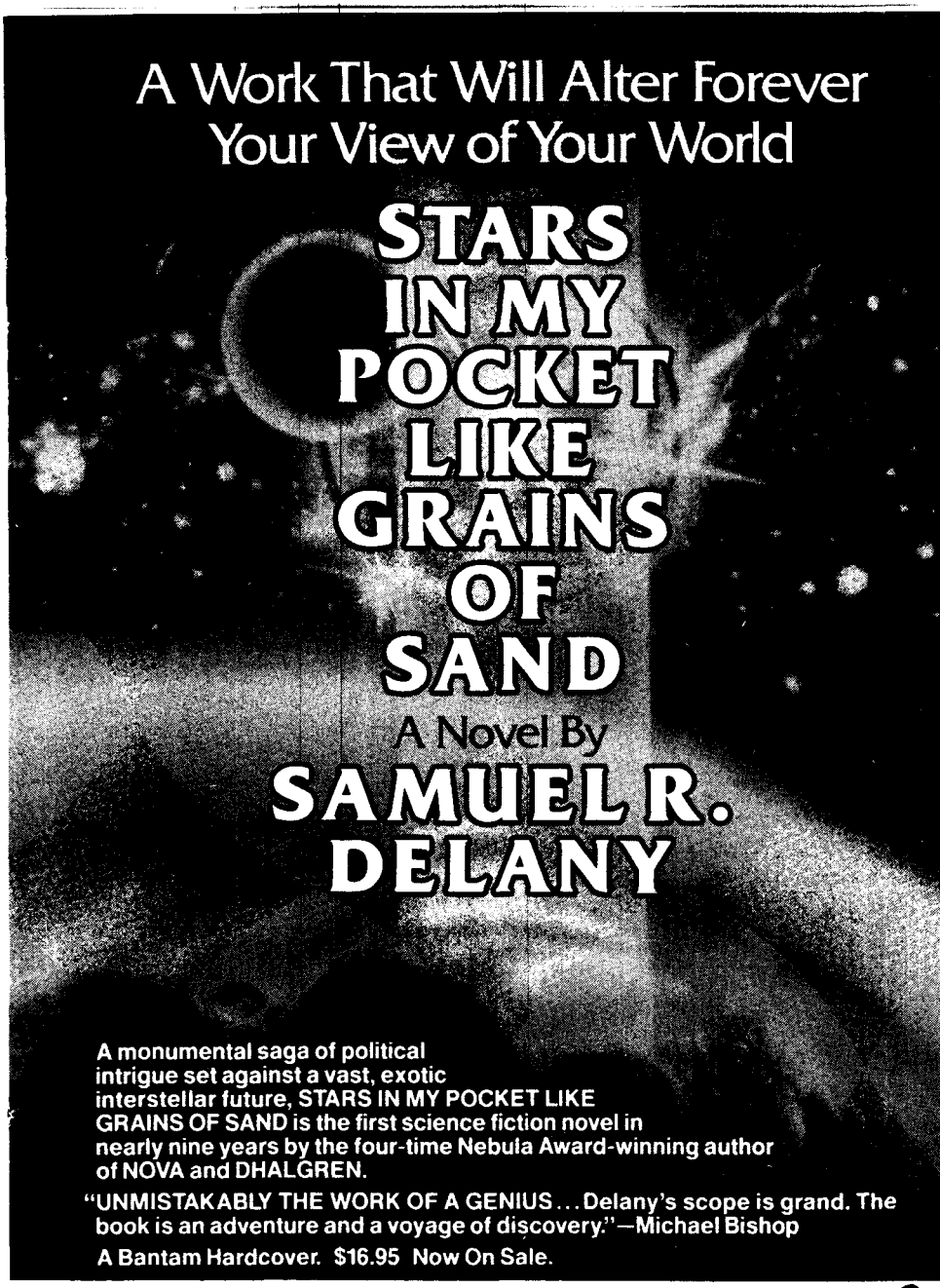
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Nevis's voice were a physical assault. Nevis scanned the room until he found the interface station. He lugged the cybertech over there, and dropped him down in a white plastic chair that seemed to flow out of the console and deck. Anittas screamed. "SHUT UP!" Nevis repeated. He picked up the cybertech's arm clumsily, almost ripping it out of its socket—it was hard to gauge his strength in this damned suit, and fine manipulation was even harder, but he wasn't about to take it off, he *liked* this suit, yes he did. Anittas screamed again. Nevis ignored him, spread the tech's bluesteel fingers, jammed them into the interface. "THERE!" he said. He stepped back.

Anittas slumped forward, his head slamming against the metal and plastic of the console. His mouth gaped open; blood dripped out, mingled with some thick black fluid, almost like oil. Nevis scowled. Had he gotten him there too late? Had the goddamned cybertech gone and croaked on him?

Then the lights blinked on, and the thin wild humming rose in pitch, and all the tiny little colored lights flashed on and off, on and off, on and off. Anittas was in the circuit.

Rica Dawnstar was rolling down the main way, feeling almost jaunty despite everything, when the blackness ahead of her became a blaze of light. Overhead, the ceiling panels stirred from long slumber, one after another, racing down the kilometers, turning the night into a day so bright it hurt her eyes for a moment.

Startled, she braked to a halt, and watched the wave of light recede into infinity. She glanced behind her. Back from where she'd come, the corridor was still filled with darkness.

She noticed something that hadn't been obvious before, in the dark. Set into the corridor floor were six thin parallel lines, translucent plastic guidestrips in red, blue, yellow, green, silver, purple. Each no doubt leading somewhere. Pity she didn't know which led where.

But as she watched, the silver tracery began to glow with an inner light. It stretched out in front of her, a thin, scintillating silvery ribbon. Simultaneously, one of the overhead panels darkened; the one just above her. Rica frowned, and edged her scooter forward a couple of meters, out of the shadows and back into the light. But when she paused, that light went out as well. The silver ribbon in the floor throbbed insistently. "All right," Rica said, "we'll do it your way." She gunned her scooter and moved down the corridor, as the lights winked out behind her.

"He's come!" Celise Waan screeched when the corridor lit up. She seemed to jump a good meter in the air.

Jefri Lion stood his ground and scowled. He was holding a laser rifle in his hands. A high-explosive dart-pistol rode in a holster on one hip and a screechgun on the other. A huge two-man plasma cannon was strapped securely to his back. He wore a bandolier of mindbombs over his right shoulder, a bandolier of light-grenades over his left, and a large vibroknife was sheathed on his thigh. Inside his golden helmet, Lion was smiling, his blood pounding. He was ready for anything. He hadn't

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felt this good in over a century, since the last time he saw action with Skaeglay's Volunteers against the Black Angels. To hell with all that dusty academic stuff, Jefri Lion was a man of action, and now he felt young again.

"Be quiet, Celise," he said. "No one's come. It's just us. The lights came on, that's all."

Celise Waan seemed unconvinced. She was armed too, but she kept dragging the laser rifle along the deck because she said it was too heavy, and Jefri Lion was half afraid of what would happen if she tried to arm and throw one of her light-grenades. "Look," she pointed, "what's that?"

The floor had two bands of colored plastic inset into it, Jefri Lion saw. One was black, one orange. Now the orange one lit up. "It's some sort of computerized guideway," he pronounced. "Let's follow it."

"No," Celise Waan said.

Jefri Lion scowled. "Listen here, I'm the commander and you'll do what I say. We can handle anything we might meet. Now move along."

"No!" Celise Waan said stubbornly. "I'm tired. It's not safe. I'm staying right here."

"I'm giving you a direct order," said Jefri Lion impatiently.

"Oh, stuff and nonsense. You can't give me orders. I'm a full Wisdom and you're only an Associate Scholar."

"This isn't the Center," Lion said with irritation. "Are you coming?"

"No." She sat down in the middle of the corridor and crossed her arms.

"Very well, then. Good luck to you." Jefri Lion turned his back on her and began to follow the orange guidelight alone. Behind him, immobile, his army stubbornly and sullenly watched him depart. ■

CONCLUDED IN NEXT ISSUE

● The only defence against the weapons of the future is to prevent them ever being used. In other words, the problem is political and not military at all. A country's armed forces can no longer defend it; the most they can promise is the destruction of the attacker. . . .

Upon us, the heirs to all the past and the trustees of a future which our folly can slay before its birth, lies a responsibility no other age has ever known. If we fail in our generation, those who come after us may be too few to rebuild the world, when the dust of the cities has descended, and the radiation of the rocks has died away.

Arthur C. Clarke, "The Rocket and the Future of Warfare"

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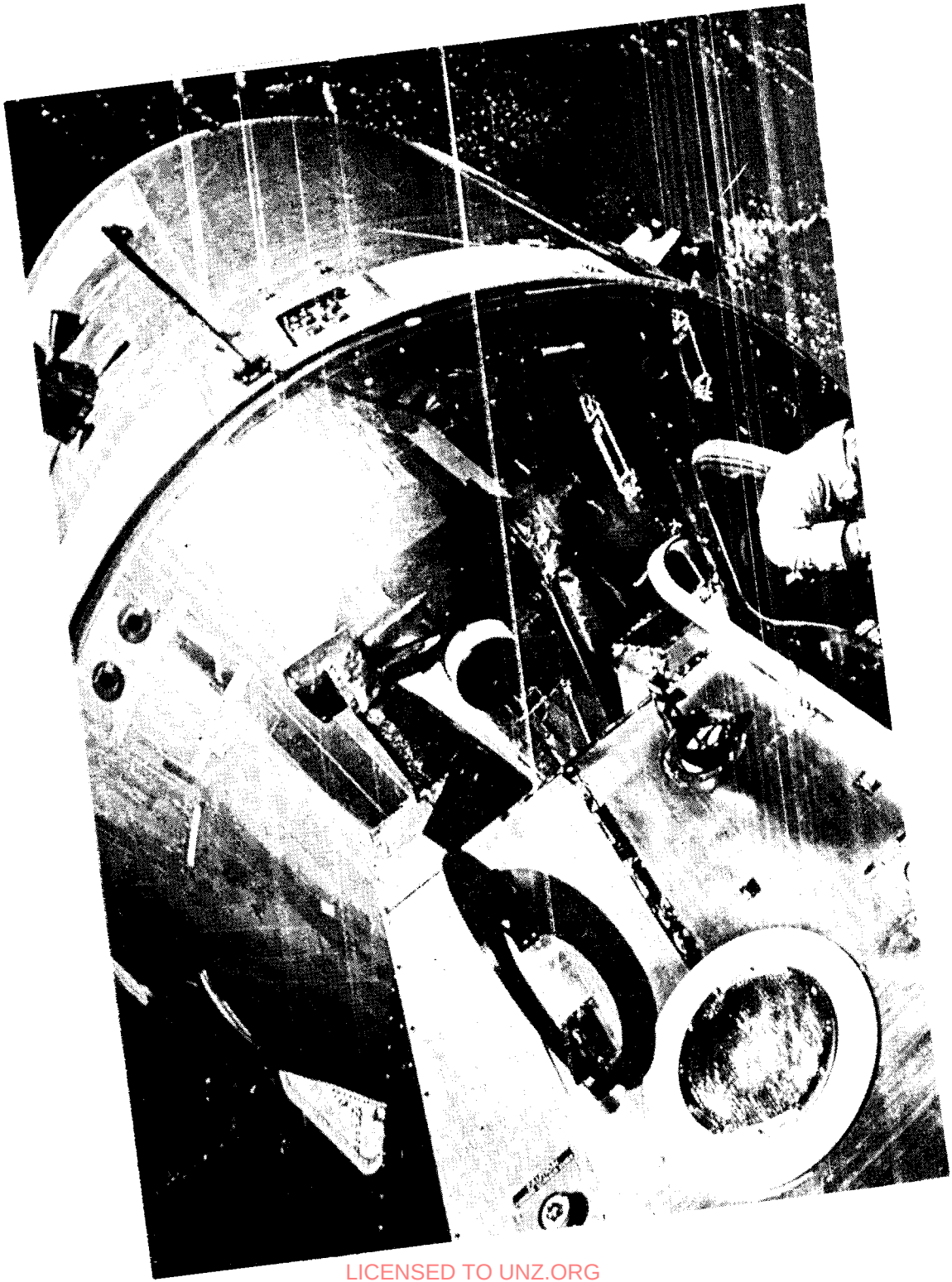

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BIOFEEDBACK IN SPACE

Walter B. Hendrickson, Jr.

Official NASA Picture

Astronaut Scott looks from Command Module aboard Apollo 9 during this space walk which was almost canceled because of Astronaut Schweickart's illness. Schweickart was the person who took this picture.

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As anyone who has ever suffered from *mal de mer* knows, motion sickness is no fun on Earth. In space, however, it can at least jeopardize the successful completion of a mission. At worst, if the spaceman happens to be sealed in a space suit when he becomes nauseated, it can be life threatening, or even fatal.

About half of all astronauts and cosmonauts suffer from space sickness. Therefore, space sickness, its causes, cures, and remedies, have been the subject of considerable investigation by the National Aeronautics and Space Administration both on the ground and in space. The subject received special attention, and publicity, on the STS-8 and STS-9 (Space Transportation System flights 8 and 9).

The effects on the body and the results of motion and space sickness are the same. In the case of motion sickness, acceleration or deceleration in an unusual direction, or alternate directions (like riding backward on a merry-go-round or a rocking ship) disturbs the vestibular system. This is the balance sensing system in the inner ear. It, in turn, stimulates the vomiting centers in the brain. In space, the same results are created by the lack of the familiar pull of gravity.

Evvie Rasmussen, a spokesperson for NASA's Ames Research Center, explains how it happens that such seemingly dissimilar environments as motion on Earth and space travel have the same effect: "When a person receives sensory cues for motion, the brain responds with its normal, programmed responses to control eye, head and body movements. But when the responses do not yield the expected results—especially when the visual image does not stabilize and postural control is not easily maintained —humans and animals often experience motion sickness."

Whether in space or in motion on Earth, the resulting symptoms are the same: disorientation, malaise, nausea and sometimes vomiting. These symptoms of space sickness are aggravated if the astronaut performs tasks involving head movements in a large work space—and what work space could be larger than the area outside a spacecraft? This makes a spacewalking astronaut a prime candidate for space sickness. If space sickness does set in, he could be in serious trouble from the disorientation and malaise, even if he manages to suppress the urge to vomit.

Fortunately, no astronauts or cosmonauts have been bothered by space sickness during an EVA. In at least one instance, however, a spacewalk was temporarily canceled because of Russell L. Schweickart during the March 3–13, 1969 flight of Apollo 9. Astronaut Schweickart became ill after a hard day of testing the Lunar Module, named *Spider* on this mission. Therefore Mission Commander, James A. McDivitt decided to cancel the spacewalk scheduled for the next day.

While space sickness symptoms and their effects are well known, how the stimulus that causes the vomiting is transmitted from the inner ear to the vomiting centers of the brain is not so obvious. It would seem that this link

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should be through the body's central nervous system. However, a team of NASA scientists working on a basic research project being conducted jointly by the Ames Research Center, Moffett Field, California, and the Johnson Space Center in Houston, Texas, discovered what they suspect may be a chemical link instead.

This chemical may be secreted in the cerebrospinal fluid, according to Ames researcher Dr. Nancy Daunton and her two Wright State University colleagues, Dr. George Crampton and Dr. James Lucot. Their research backs up this hypothesis by showing that completely blocking the cerebrospinal fluid in the brain stops the vomiting, but a partial block does not. If the researchers are correct, this is the first time a biochemical function has been attributed to the cerebrospinal fluid.

Blocking the cerebrospinal fluid is not the answer to preventing space sickness, however, because the fluid serves as a pressure control and shock absorber for the brain and spinal column. Thus, Dr. Daunton and her colleagues are trying to isolate the chemical responsible for motion sickness from the rest of the spinal fluid.

There are, of course, a variety of medications available for motion sickness. These, however, have undesirable side effects, such as drowsiness—not the best condition to be in when you are performing a complicated space mission.

Obviously NASA and the spacecraft manufacturers have taken steps to avoid any contributing factors to space sickness. The spacecraft's cabins are kept well ventilated and odor-free. Also, the spacecraft's stabilization system keeps the craft steady, at least during most of the flight. Although the moon-bound Apollo spacecraft did rotate like a barbecuing chicken to keep the temperatures even, there is no evidence that this caused any space sickness problems. It is possible, however, that the undocking and redocking tests of the Lunar Module on the Apollo 9 flight may have contributed to Astronaut Schweickart's illness.

Prior to flights, the diets of the astronauts are also watched carefully to alleviate problems other than space sickness. However, none of the other conventional self-control remedies, such as keeping eyes fixed in a given spot and not looking out a window, can help—at least until spacecrafts start carrying passengers.

Along this line of self control, NASA-Ames psychophysiologist, Dr. Patricia Cowings, and her research associate, William Toscano, a UCSF doctoral candidate, are working on a method of controlling motion sickness through biofeedback. Whether or not Dr. Cowings's techniques prove useful in combating space sickness, they will be useful in countering other forms of motion sickness. This is because it treats the symptoms common to all forms of motion sickness.

Dr. Cowings tested some 110 volunteers, including her own research assistant, in the biofeedback tests. Following standard experimental procedure, Dr. Cowings divided the sub-

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jects into two groups. One group received training in biofeedback, and the other, the control group, received no training. The trained group received six hours of instruction in biofeedback techniques as well as mental exercises optimizing their responses to speed up the learning process.

Both groups were tested on a rotating chair, and in a vertical acceleration simulator. During these tests, the trained subjects monitored bodily functions such as respiration and heart rate, learning to recognize when their bodies were operating best.

Eighty-five percent of the trained subjects were able to improve their resistance to motion sickness. Of this group, sixty-five percent withstood the illness no matter how fast they were spun. The remaining twenty percent could tolerate a significant increase in spinning before they became sick. As for the remaining fifteen percent of the trained subjects who failed to overcome motion sickness, Dr. Cowings thinks that they could succeed with more training.

None of the untrained subjects in the control group showed any improvement in their ability to withstand space sickness. However, both the trained group and the untrained group provided the profile of the individual most likely to have motion sickness.

This is the young athletic person, either male or female. In other words, this is the choice astronaut candidate. The problem is that an athlete's body has the strong reactions needed to perform athletic feats, but these make for inappropriate responses to ordinary stress situations. Although Dr. Cowings tested only individuals between the ages of 18 and 45, she found that the older subjects were less susceptible to motion sickness.

The next step in these biofeedback experiments will be tests in space. If scheduling permits, these tests could go aboard the Spacelab's life sciences flight schedule for Spacelab D-1 in June 1985 on the twenty-sixth flight of the Space Shuttle. Besides William Toscana, Dr. Cowings' colleagues for this Spacelab experiment are Dr. Neal Miller of Rockefeller University, Dr. Ernest Hilgard of Stanford University, Dr. Joe Kamiya of the University of California, San Francisco, and Dr. Joseph Sharp, deputy director of Life Sciences at NASA-Ames.

None of these men are astronauts, so Dr. Cowings will be training the astronauts for the mission, if it is approved, as she has trained other subjects over the past decade. When the mission is launched, each astronaut will wear tiny, eight-channel cassette tape recorders monitoring their phsiological responses, and providing them with a feedback display.

This experiment will be unique among those in space because to be a success, one of the subjects must feel the symptoms of space sickness. Otherwise, they will just be consciously checking their responses daily to make sure that functions are optimum. If the astronaut does feel sick, he will immediately have to begin biofeedback procedures for up to 30 minutes. If this fails to stop the sickness, the astronaut will push a button on the tape marking the point in time so it can later be studied by Dr. Cowings, to determine what led to the attack. ■

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At first there was no space.

How could there be? The Cosmic Egg was crammed with the potential for mass-energy, but it was all undifferentiated. No manifestation so gross as *particles* had formed yet. With no way to distinguish parts of it from one another, there was no space.

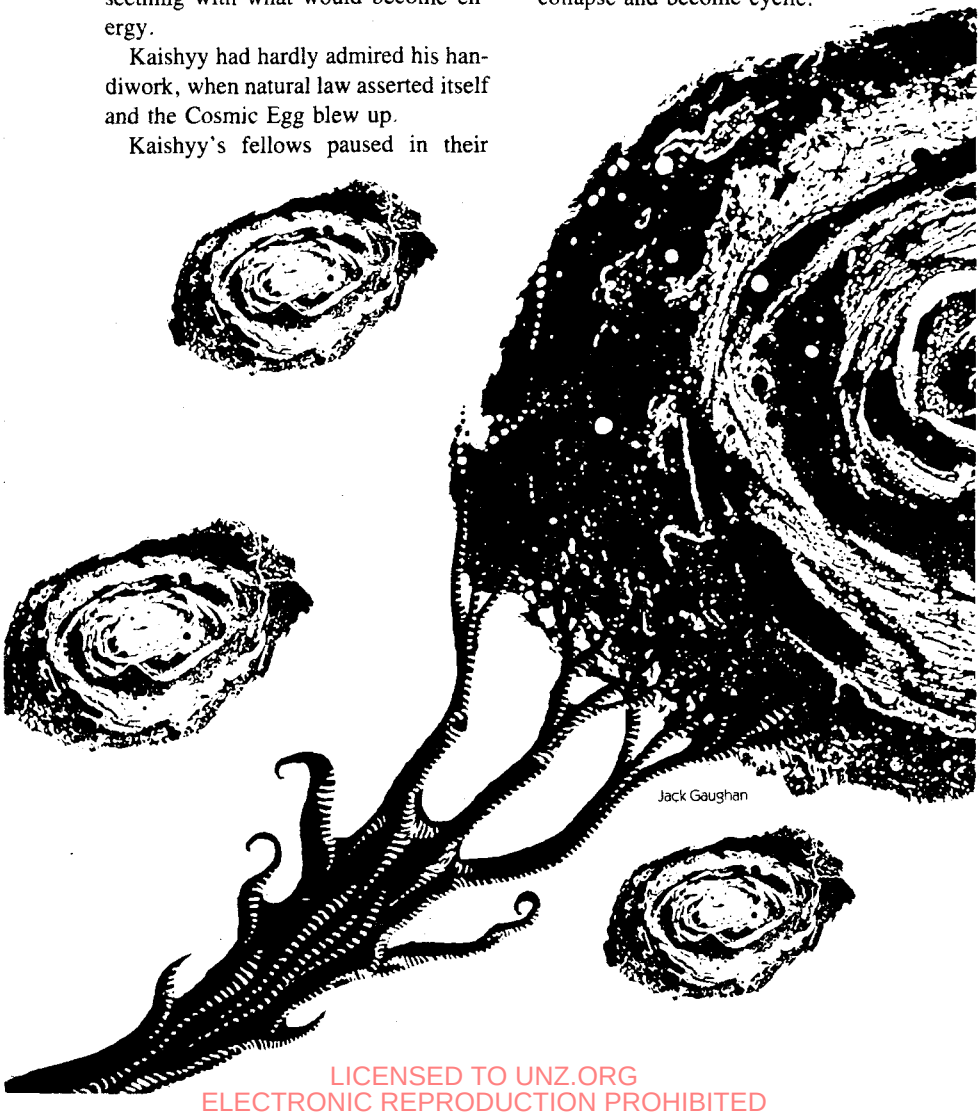
No space, no time. Just formlessness seething with what would become energy.

Kaishyy had hardly admired his handiwork, when natural law asserted itself and the Cosmic Egg blew up.

Kaishyy's fellows paused in their own work for a moment, and one of them sneered derisively. "Well, you got it to explode. I'm surprised."

"What do you mean?" Kaishyy said as sweetly as he could manage.

"There's not enough mass-energy in it," the other said. "Oh, it might be pretty now, but soon enough it'll spread out and get uninteresting. It'll never collapse and become cyclic."



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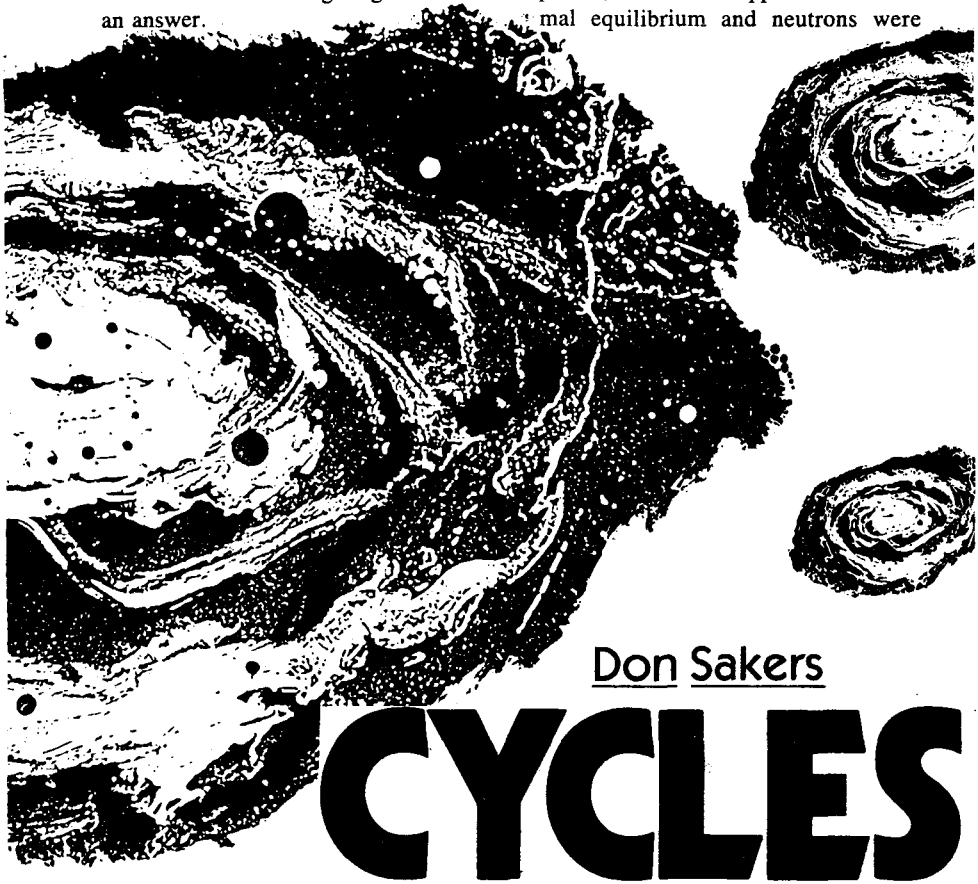
Another novice joined the taunting. "You mean Kaishyy's made an open universe? Too bad, Kaishyy—you'll make a fool of yourself in front of the Masters."

Kaishyy gave his own private grin, and turned toward contemplation of his infant cosmos without giving the others an answer.

Changes happened too quickly to make any impression, as the universe expanded and newly-formed time ticked off interval after interval. Particles formed—photons, neutrinos, quarks, and then whole classes of lesser particles. By the time the first second had passed, neutrinos dropped out of thermal equilibrium and neutrons were



Don Sakers

CYCLES

"Rules" for creativity tell how to produce results that will, almost certainly, be "acceptable." To do *exceptional* work, you may have to try something different!

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forming. The distinction between matter and energy was beginning to make its presence felt in a shadowy sense.

It took a few more minutes before the temperature had dropped far enough to allow atomic nuclei to form. Abruptly a threshold was passed and they began forming all over the place. In seconds all the free neutrons were snapped up, and the universe was a dense cloud of alpha particles, beta particles, and energy.

Kaishyy felt the presence of a Master behind him, and looked around. The Master gave a tolerant gesture. "Not enough mass-energy for collapse, Kaishyy. An open universe is of no use to anyone. Do you wish to start over?"

Kaishyy shook his head. "I will stay with this one."

The other nodded. "Your decision. But I feel it a waste of time."

"Thank you for your opinion, Master."

Kaishyy's universe had cooled appreciably by now, about five minutes after its creation. Kaishyy relaxed and looked further along the course of time—nothing much of interest would happen for a while.

Seven hundred thousand years after Creation, stable atoms began to form in Kaishyy's cosmos. In only a few centuries the brilliant blaze of light subsided as his universe became transparent. This result ran quickly through the experimentation area, and for a moment Kaishyy was the center of attention.

"Hey, Kaishyy, how'd you do that? Mine hasn't even begun to make atoms yet."

Kaishyy smiled. "Yours is too massive. Mine cooled much more quickly."

Hodal made a rude gesture. "Ours will collapse, though. You'll see. We'll get better remarks from the Masters."

"We shall see," Kaishyy said, and went back to watching his project.

Interesting things developed—stars, galaxies, quasars, all manner of complex forms of matter and energy that Kaishyy watched for quite a while. The universe continued to expand, slowing slightly as it went but not at a rate that would lead to ultimate collapse.

After five or six billion years life developed in one of Kaishyy's galaxies. He looked around for his companions, to convey this news—but they were all busy with the atoms that had come about in their own universes, so he left them alone. Kaishyy simply watched, amused by the antics of his little creatures.

The little creatures provided Kaishyy with many diversions. In the meantime, some of his comrades' universes developed life of their own . . . but when he took the time to look, Kaishyy decided that *their* life was dull and sluggish compared to his.

After merely 10^{12} years, Hobal let out with a great cheer and Kaishyy looked over to see what had happened. Hobal's universe, a very massive one, had begun to collapse and it blazed with energy.

Hobal looked rather apologetically at Kaishyy. "Sorry, friend."

Kaishyy waved. "Don't worry. Good luck with the Masters."

In no time at all, it seemed, Hobal's universe had collapsed back to its original spaceless, timeless potential mass-energy. A Master stood by and gave a nod at the appropriate instant. "If you do not shut it down, it will continue to oscillate, getting larger each time."

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Hobal wiped out his Cosmic Egg and then, grinning like a fool, followed the Master away from the experimentation area.

Kaishyy sighed, and went back to his universe.

Life continued, which pleased him, but his universe was having troubles. One at a time, the pretty stars were winking out, or destroying themselves in tremendous explosions. And collapsars were forming in alarming numbers. Kaishyy knitted his brow and contemplated deeper. And there was a Master at his side.

"It is still not too late to start over, Kaishyy," the Master said graciously.

"No thank you. I stand by my project."

"As you will."

After 10^{14} years, all of Kaishyy's beautiful stars were gone. A number of other universes had collapsed in the interim, and their owners had gone with the Masters.

But now, at least, everyone who was left was having problems with their stars. Before too long, Kaishyy thought with satisfaction, all the other universes will be dark.

Although the stars were dark, they continued to move . . . and in their motion, they kept sweeping close to one another. Each encounter did some damage—threw away planets, perhaps, or catapulted stars out of their galaxies. Or, even worse, made stars spiral down into the massive collapsars that had formed at the centers of Kaishyy's galaxies.

He shook his head at the trend, but continued to watch. By the time 10^{18} years had passed, all his galaxies had evaporated and his universe consisted of dead stars, cold wandering planets, and black holes. Most matter was, by this time, iron.

Still, life persisted, living on residual radiation and what it could extract from the still-energetic zones around collapsars. Kaishyy felt a little warmer when he observed living beings huddled around his collapsars—none of the others would have living things as long as he would. The collapse of a universe, of course, destroyed all life.

Kaishyy watched, as time ticked on and more and more of his fellows completed their projects. Finally, about 10^{30} years after he'd started, there were only a handful of the least massive universes left. And Kaishyy noticed a disturbing trend in his own cosmos.

For the first time he felt uneasy, and looked up for the guidance of a Master. At once one was with him. "What is it, Kaishyy?"

Kaishyy gestured to his universe. "The protons and neutrons are decaying."

"They *do* that, after long enough."

"Why wasn't I told?"

"Nobody ever thought you would make an *open* universe. Most closed universes don't stay around long enough for proton decay to set in."

"It's not fair."

"Kaishyy, you chose to work in applied cosmology—you have to accept natural laws the way they are." The Master shrugged and, not unkindly, said, "If you had started with more mass-energy . . . "

"Never mind. I still say my universe is interesting."

"But rapidly becoming less so." The Master left Kaishyy with his product.

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After 10^{32} years all his protons and neutrons were gone, and his universe consisted of nothing but collapsars, photons, neutrinos, and a thin haze of electrons and positrons.

One by one, the other universes around him collapsed back to their Cosmic Eggs, and the students left. Finally, about 10^{50} years after the beginning, Kaishyy was alone in the experimentation area.

"Kaishyy," he heard, and turned to see Hobal in the form of a minor Master.

"So you're a Master now, eh? Good show, Hobal."

"Listen to me, Kaishyy. What you've made is useless. It'll never collapse; it'll just keep expanding until it's gone completely. Look how big it is *now*. Give up, start over, and in a fraction of the time you've wasted so far you can complete your project."

"All the Masters do it that way, Hobal. Well, I happen to think my way is also right. Look at this." He pointed.

"What?"

"There. Even with all the protons decayed, life continues. They've managed to draw their thoughts in photon and neutrino patterns, taking energy from collapsars."

"Life. The rest of us are Masters now. Do you know how embarassing it is to have you still down here? And fooling around with life, yet."

"The Masters watch, Hobal. They will judge me. But not until my project is over."

"All your friends are Masters now, Kaishyy. We're going to be among those watching you. And believe me, we can't let you get good remarks for a shoddy project like this."

"Oh, go away, Hobal."

Hobal left, and Kaishyy watched his cosmos expand.

Now and again, there was a bright flash, and these puzzled Kaishyy until he caught one in formation. Ah, yes, the collapsars were evaporating. He remembered something about that. Well, let them evaporate. Who needed them, anyway?

Alone, Kaishyy watched and watched. When 10^{100} years had passed, the last collapsar was gone, and he sighed. They had been exciting in their demise, at least.

Life, however, continued. It clung to patterns in photons that were becoming more and more red-shifted as the universe expanded.

After 10^{125} years, all the positron-electron pairs had collided and annihilated one another in showers of photons. Somewhere in the interim all the neutrinos had decayed—they were so hard to spot that Kaishyy had missed their departure. Now there were only photons, endlessly spreading in wavefronts that carried the last furtive thoughts of life.

Kaishyy was aware of attention upon him, the attention of the Masters. The question, he knew, was no longer "What will Kaishyy's universe do," but rather "How long will Kaishyy sit there?"

Well, he thought, let them watch. Kaishyy will surprise them.

At 10^{200} years, Kaishyy's photons began to decay. Less energetic particles formed, their wavelengths blurring outward to fill his universe. Now even life was in danger, for no possible organization could hope to survive this sort of decay.

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At 10^{250} years, long after the last coherent thought had winked out in his cosmos, Kaishyy put a stasis on his project and turned to face the assembled Masters. "My experiment nears its end," Kaishyy said. "I hope you will all attend."

"He's gone mad," Hobal said.

Kaishyy ignored the comment, pointed to his cosmos. "Look. All particles of energy have been decaying. Their wavelengths are now just about the size of my universe. Watch as I let the process continue for a few googol years."

Stasis released, time continued to flow. And the particles spread out, out —until their theoretical size filled the bloated boundaries of Kaishyy's universe. Now there were, in effect, no more particles—only the potential of mass-energy.

In Kaishyy's universe, 10^{250} years after creation, there was no space. How could there be? It was crammed with the potential of mass-energy, all undifferentiated. No manifestation so gross as *particles* remained.

No space, no time, just formlessness seething with what had been energy.

Kaishyy smiled. "Conditions are now identical with the beginning of my experiment."

Hardly had he made the statement, than natural law asserted itself, and Kaishyy's universe blew up.

In the distance, the oldest and wisest of the Masters radiated satisfaction. To this one Kaishyy bowed. "Master of Masters, if my experiment is run enough times, the life that it produces may manage to free itself from the bonds of its universe before photon decay sets in. Am I right, Master, in conjecturing that this is where *we* came from?"

The Master gave a benevolent nod.

Kaishyy grinned in self-satisfaction and looked over the others. "You see, an open universe *can* be interesting." Then he turned his back on them all, and attended to his creation.

Particles started to form . . . ■

● No man ever looks at the world with pristine eyes. He sees it edited by a definite set of customs and institutions and ways of thinking. Even in his philosophical probings he cannot go behind these stereotypes; his very concepts of the true and the false will still have reference to his particular traditional customs. . . . From the moment of his birth the customs into which he is born shape his experience and behavior. By the time he can talk, he is the little creature of his culture, and by the time he is grown and able to take part in its activities, its habits are his habits, its beliefs his beliefs, its impossiblities his impossibilities.

Ruth Benedict

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Jay Kay Klein's biolog

Donald Philip Sakers is apparently the only *Analog* writer to be born in Japan. His father was a communications technician for Naval Security, and Don was a baby boy bounced around the world for seven years until reaching the haven of suburban Baltimore, where he has remained ever since. If ever there was an archetypal *Analog* reader, it was the communications technician, so it's no wonder Don early contracted an incurable love of science fiction. Further, he started hand-writing science fiction juveniles into copybooks in the seventh grade, followed by submissions to this magazine when he was just 14 years old.

Education at Baltimore's Loyola College provided one of the staple combinations for would-be science fiction writers: a B.A. in mathematics with a minor in English literature. His bread-and-butter job is working as an associate librarian in the first computerized branch public library in its area. Having to deal with the shock and possibilities of automation that face a human institution dating back at least to the ancient Greeks, and probably the Egyptians, has proved a delight for Don from a science fictional viewpoint.

Writing is a part-time activity, and includes book reviews for the *Baltimore Sun,* some pornography, and best of all from the writer's standpoint, science fiction. A first sale to *Analog* came in the October, 1982 issue with a "Probability Zero" yarn that used a consequence of Einsteinian mathematics to illustrate a favorite scientific axiom of this magazine's readers: "You can't win, you can't break even, and you can't get out of the game." A novelette with the unusual viewpoint of a tree as the main character appeared next in the August, 1983 issue and was so striking it was included in Donald Wollheim's *1984 Annual World's Best SF.*

Constructing a story with Don is something like building a Double Helix molecule by molecule. The initial template often comes from some development in science. This mixes over a period of time with other memory data acquired often years before and now proving of use perhaps for the first time. The basic idea his unconscious comes up with almost always needs background work to provide a solid, scientifically correct foundation. Then he gets behind a keyboard and sweats out the details.

Don Sakers

Don's inward life is where he has his adventures. Externally, he lives in a two-bedroom apartment, with one of the rooms given over to bookshelves, file cabinet, typewriter, and a king-size desk. For mundane travel in the atmosphere he has a Plymouth stashed in the parking lot. This has piled up a lot of miles getting to every science fiction convention he can reach, including every world convention since 1976. ■

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If a sufficiently advanced technology is really indistinguishable from magic, it may require some difficult emotional adjustments.
Judith Mitchell

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A TOUCH BEYOND

Stephen L. Burns

Brightflash silver, catching the light.

The silver metal pin shaped so: Two hands, crossed at the wrists, arms ending just before the elbows, fingers spread wide.

Some say that the palms and fingers are turned inward, to protect the heart that they cover. Some say that they turn outward to connect that same heart to the world.

Both may be right.

Dr. Georgory Marchey arrived on Ixion Station. He moved out onto the ramp slowly, feeling light and irresolute as a balloon in the .75-g of the Station. After the high-speed shuttle ride he felt as if different parts of his body were moving at different speeds.

Almost as if to guarantee that he remain off-balance, he was greeted by an unexpected, unnerving sea of upturned faces filling the receiving bay. His ears were filled with the sea-sound of the echoing rumour they made. He knew that they were not gathered there to greet him specifically, but he still felt like he had been thrust into a sudden spotlight.

Marchey's mood was much heavier than his blocky body felt. He had not seen Ella in over eight years. They had been desolate years of missing her, years of a new pride and shame, years during which a reached dream had taken on the dark trappings of nightmare. To see her again might be the first light of a new morning or the last glimpse of light before darkness reclaimed him.

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Before going through the lock and out onto the ramp he had nervously checked himself over one last time. The gray velvet gloves he wore were clean and secure. His darker gray coverall was clean as well and the sleeves were snug at the wrist. The few strands of gray and black hair he still possessed were pushed back in place. Lastly, unconsciously, he had touched the silver metal pin he wore over his heart.

When he realized what he was doing he took his hand away, clasping it with his other hand as if to keep it from straying there again. But his awareness of the pin—and what it meant to him—remained at the fore of his mind. Not that it was ever forgotten.

He had tried to leave it behind, but found that he could not. It was a part of him, marking him for what he now was, medal and stigma all in one. Sleeves and gloves might hide what he had become from Ella's eyes for a while, putting off the dreaded moment for a brief respite, but she would know in the end.

He could only hope that she would understand. The lower gravity of Ixion Station did nothing to lighten the burden of his fear that she would not.

Ella Prime tried to bear the press of bodies about her stoically. She failed, but she stayed. It seemed to her that almost every resident of the Station had turned out to greet the shuttle's arrival. She had not been near that many people all at once in longer than she cared to remember—since she had fled Earth and come to Ixion Station.

Ixion was a great wheel that hung turning in the lonesome gulf between the orbits of Jupiter and Saturn, roughly 6.3 AU from Earth at their closest conjunction. Only about once a year would a supply ship venture out into the vast and daunting emptiness beyond the Io

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and Europa Bases to visit Ixion Station. The UNSRA labs, observatories and training facilities—along with the small but thriving society that had grown with those installations—rated no more than that. It was hoped that when Saturn's mysteries were brought into mankind's realm this would change for the better.

But until then Ixion would remain humankind's furthest-flung outpost and the annual arrival of the supply ship with its shuttleloads of personnel and supplies would be a cause for celebration. Nearly everyone dropped what they were doing and hurled themselves into a desperate round of partying called ShipTime.

This was the first ShipTime that Ella had not made a point of avoiding. Five people in a room was horror for her, the densely packed bay a visit to Hell. Yet she stayed, one quiet member of the rowdy throng, a recluse far removed from her element, full of fear and hope.

Nothing but strangers had yet come down the ramp. Most of the new arrivals were unknown to those residents jammed into the vast bay, yet every single one to step onto the ramp was met with cheers. Any new face was a treat in their small, closed society, and it would be a year before they saw any more.

Then Ella saw Marchey emerge, blinking against the light and noise. Her heart leapt. *He had come*. Now they would be together again. She began to push her way to the foot of the ramp.

Marchey spotted Ella and halted uncertainly. She was not that hard to pick out of a crowd; she stood a head taller than nearly everyone else, as if her genius had raised her up and marked her for all to see. Her long, plain face, always so unhappy and watchful when she was out in public, broke into a sunny smile as she saw him.

Marchey clamped down on the urge to turn and run. After a few moments he smiled back hesitantly, took a deep breath, then continued to shuffle down the ramp. He wondered if his fear had shown on his face. He hoped not.

They met at the bottom of the ramp, two mismatched figures embracing to become one. Ella was almost freakishly tall, thin, and plain-featured, her skin and hair so pale that she could pass for albino. Only her bottle-green eyes spoiled the effect. Marchey was short, swarthy, and gnomish, the balding top of his head barely reaching the level of Ella's small, low breasts. They held each other wordlessly, desperately.

Whispers buzzed outward from them and many eyes turned their way. Almost every resident knew of—though almost none knew—their famous resident, Ella Prime. They knew of her fame and reputation in the art world, for a bit of it rubbed off on their Station.

They also knew that she pursued a life of near-total solitude, an end so important to her that she had come to lonesome Ixion Station to live and work. Not long after her arrival she had tripled her fees and commissioned an off-station habitat to be built and shipped on the next supply ship.

At the beginning of her second year she moved into it, using it as both home and studio, calling it the Fort. The name fit. Many a resident suspected that as long as there was Ella's artwork leaving the Fort and riding back by supply ship

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they would not be entirely forgotten or budgeted out of existence.

Now here she was, out in public —during ShipTime, no less. To meet a man—a *lover*, judging by the intensity of their embrace. That was *romance*. That was a wonderful infusion of unexpected spice to add to the already heady brew of the day.

Heads turned. The whispers buzzed outward and on.

Ella loosened her embrace so that she could look at Marchey's face. She was frightened by how drawn and haggard he appeared, how tired and defeated he looked, but did not mention it. She kissed the rough crag of one cheek, tasting dried salt. "I missed you," she whispered hoarsely, rubbing her cheek against his.

"I missed you too," he husked in return, his lips moving close to her ear so that he could be heard over the rising din in the receiving bay. Somewhere back in the crowd a ragged chorus of "The Long and Winding Road" had begun. Marchey recognized the song and knew that it had indeed been all of that.

Ella held him tighter yet, hunched over so their faces touched. "We can try again. Things will be just like before. Better!" She rested her cheek on the top of his head. "But this time it won't end."

Marchey said nothing. He clung to her desperately, hiding his face in the warm hollow of her shoulder, feeling at once elated and terribly afraid. He did not know how he could stand losing her again. For a moment he wished he had never come.

* * *

The gently sloping corridors of Ixion Station rang with the shouts and laughter of its merry-making residents. The ShipTime celebration was in full swing.

The outering floors were planted in a lush green carpet of hardy airgrass. Here and there the grassy concourse narrowed, providing semi-open alcoves where shrubs, flowers, and dwarf trees had been planted, creating several bowers or miniparks. Though not of the size and standards of the fields and groves of the great cylinder cities, it was a nice humanizing touch for people far from their green planet.

Many of these bowers held impromptu gatherings and individual parties. The traffic from bower to bower —party to party—was loud and constant. Toasts and songs pealed in at least ten different languages.

Ella and Marchey had removed their slippers and walked barefoot along the outering corridor—Park Row. Ella carried a bottle that had been thrust into her hands by a laughing, red-faced man wearing nothing but a bright red bow tied around his broad middle. He had proclaimed that "Astrophysics Ennobles, but Alcohol Enables!" then had run off before they could thank him or ask what that meant, exactly. He had been hotly pursued just moments later by a laughing black woman armed with a butterfly net.

"Wild place," Marchey remarked mildly as they watched the woman vanish. He waited for Ella to take a drink, then accepted the bottle as she grinned and handed it over.

"Not usually—or so I hear. But this," she did a loose-limbed little dance

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step. "—is a holiday!" She could not remember feeling this good in quite a long time and she smiled at the reason.

Marchey wiped his mouth and glanced at the bottle's label with respect. "Good booze." He winked at Ella. "And a dancing-lady. Where we headed, dancing lady?"

Ella leered, snagging the bottle. "I'm taking you to the Motel."

"That so? No room at your place?" He watched her drink.

Ella lowered the bottle, staring blankly, then laughed. "I have a whole habitat to myself, dear man." She took a long pull from the bottle. "But my bug's down and you can't get anything fixed during ShipTime. So we stay here on th' Wheel." She absently took another swig, shuddering as it went down.

"You don't stay here at all?"

"Nope! I can 'ford my own place and I damn well use it! You gotta 'member that *I*," she drew herself up grandly, brandishing the bottle like a trophy, "am Ella Prime, artsy enigma, famous artiste, an' a very rich lady thanks to these hands." She wriggled the fingers of one hand, staring at them intently. "I even 'sured 'em," she muttered.

Marchey realized that she was getting quite drunk—she had never had any tolerance for alcohol. He relieved her of the bottle, then the bottle of a liberal portion of its contents.

Ella stared at him, her long plain face suddenly bleak. "I got what I wanted —far from th' maddenin' crowd, right? An' movin' out here strapped jets t' my reputation." She sighed. "But sometimes it's lonely. Without anyone . . .Without *you*. This is th' firs' time I been in to th' station in a'most five months. Work, y'know."

Marchey winced. *Work*. One poor word to cover a whole world of meaning. He knew all too well the extremes one could be driven to by their work. Ella had left Earth and moved to one of the most isolated places imaginable. He had . . . found his own extremes. Would she be able to understand them? His good mood dissolved at the answer he expected to receive.

Ella stole the bottle back, drank. They had to step to one side to allow some chain-dancing revelers to snake by, beckoning them to join in. Ella ignored them, glaring at Marchey challengingly.

"How 'bout you? I better hear you've been takin' some time from your damn med'cine t'do some sculpture yourself!" She was slurring her words so badly that sculpture came out *skulcher*.

Marchey wished that her question could be sidestepped as easily as the dancers just gone by, but knew she would demand some sort of answer before she let the matter drop. That had been what had brought the together some sixteen years before. He had been a practicing surgeon who dabbled in art with some success, and she had been an up-and-coming sculptor already making large waves in the art world. His hands had not touched clay or stone for quite a while, for more reasons than simple lack of heart for it after she had left his life.

"Not really—nothing that matters." Would that be answer enough?

It was not. She glared down at him. "Matters, hell! You coulda been as good as me if you'd worked at it like you did med'cine!" She blinked owl-

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ishly. "Well, almost as good." She began to giggle. "That's two things!"

Marchey took the bottle away from her. She'd had enough, he thought, and he had not—not by a long shot. "What two things?"

"Two things t' getcha back into. One, I gotta getcha back into skulcher, Gorey." Then she leered at him, waggling her faint eyebrows. "Two—an' most 'portant—gettin' you back into *me!*" She licked her lips and turned solemn. "An' soon." Through the liquory haze she could hardly believe how badly she wanted him then.

It took all of Marchey's self-control to keep from grimacing. It was too soon. That would be the worst way for her to learn what he had become. Was there a best way?

His free hand found its way to the pin he wore and again he wished he could renounce it. It was a brand proving that he was no longer what he had been before and cast a long shadow over the promises made by the memories of what they had once shared. He wanted then and there to strip off his secrecy and show her his pride and his shame, to ask if it changed anything, changed everything.

Because of who and what she was, it had to; the memories confirmed it, seemed to cast the coming moment in stone. It had surely changed him. Somehow he managed to produce a smile and a light bantering tone when he spoke. Had Ella been sober she would have spotted both as artificial.

"Impatient, aren't we?"

"Yes," Ella replied simply. She reached out hesitantly to stroke his face. Her hand trembled. "I've missed you so much. I—I remember your soft hands on me in the night, the way you'd run your fingers—" Giving voice to the memories made the need twist through her like a whirlwind.

Marchey died inside at what she chose to remember. He interrupted her hastily, fighting a tide of desperation.

"Can we wait for a bit—have something to eat first?" He felt a bit of control coming back. "The food on the shuttle was awful, and I'm going to need my strength—"

Ella could sense his fear and reserve but could not think clearly enough to find its source. The food might help sober her, she thought, and it was just too hard to think of an alternative.

"How fast c'n you eat?"

He looked into her face, seeing her disappointment and bewilderment. His love and his fear made him almost physically ill. "Fast enough," he managed with false joviality. He held his breath.

"Then *maybe* . . . but don't be s'prised if I drag you under a table an' ravish you 'tween courses."

Marchey thanked whatever gods there were. "I think I can stand the suspense."

There were three restaurants as such on Ixion. Ella took Marchey to the best one. It was crowded, but Ella's prestige quickly secured them a good table. The restaurant served a little of everything and went by the gloriously inelegant name of Casa Mondo Swino.

Marchey began to feel better as he watched Ella demolish the appetizers almost singlehandedly. The food helped sober her, and it appeared that she wanted to stay that way; for though she

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ordered a large bottle of wine, she barely touched her glass. He felt no similar reticence. He had been on good terms with alcohol for most of his life, and during the last few years it had become his constant companion. By the time the entree was served he had emptied the first bottle and had started on a second.

Things were going well. Ella had forgotten her impatience, happy just to be with him again. Marchey's mood was improving with every glass of wine and with every precious moment spent with Ella. He refused to let himself think about what might happen later. The wine helped.

They were halfway through their main course when the Miatre d' approached their table. "Mme. Prime," he said quietly, bowing, "I regret the intrusion, but there is a call for you."

Ella scowled at him. "Who the hell is it?"

"The caller is Dr Carol Chang, Head of Ixion Medical Services, Mme. Prime. She insisted that I tell you that it was a matter of life or death." He stepped back and waited impassively.

Marchey's ears pricked up at the mention of Carol Chang's office and title. Already suspecting what the call might be, Ella was looking at him. She seemed to be holding her breath. He tried to smile. "You better take it."

Ella frowned. That was not the answer she wanted. She gestured curtly. "Put her through."

The Maitre d' bowed. "As you wish." He placed a holit in the center of the table, cued it, then turned and strode off.

The holo-image of the head and shoulders of an oriental woman appeared over the center of their table. She looked grim and impatient, and when she saw that she had been put through she was only able to manage a brief, tight smile. "Ms. Prime?"

Ella inclined her head fractionally, her face expressionless. "Yes."

"I am Dr. Chang. I regret this intrusion, and want you to know that I would not have called had I any other choice. I—ah—understand that Dr. Georgory Marchey is your guest. An emergency has arisen and it is imperative that I speak with him."

"Well," Ella began unhappily. She remembered, it was always an emergency. How many times?

"Please," Marchey whispered, his hand sliding to the small of her back, making her shiver.

"He's right beside me." Ella said tonelessly. She snatched up her wineglass and drained it.

The disembodied head turned toward Marchey, and the woman's smooth features lit in a genuine smile. "Dr. Marchey, this is an honor. Again I apologize for the interruption."

Marchey watched Ella refill her wineglass, then faced the image. "No need to apologize. You mentioned an emergency?"

Dr. Chang nodded. "One of our young people, Shei Sinclair, somehow managed to build a toy cannon and make powder for it toward the ShipTime celebration. The toy exploded in her face when it was fired." Marchey grimaced, and beside him Ella stiffened, wine halfway to her lips.

"She was critically injured. Her condition is extremely grave. We have re-

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moved several metal fragments and stopped the worst of the bleeding. But two fragments that we know of still remain lodged in her brain, and out of conventional surgical reach. One entered through her eye. There is intracranial hemhorraging and her autonomic functions are failing fast—we are already using machine assist to keep her breathing. I am afraid that cardiac function will soon fail as well. She will die for all we can do for her now.

"I was running a review of the medical records of our new arrivals when this arose, and saw yours. You are a Bergmann Surgeon, and I have to look upon your arrival as a gift from God. If you—"

There was suddenly a high-pitched buzzing sound in the background of Dr. Chang's pickup. The grating buzz was quickly replaced by a metronomic beep. She looked at something offcam, then turned back toward Marchey. Her grim expression had returned and redoubled.

"She just went ECS. Can you help?"

Had Marchey been alone, he would have already been on his way. But he was not alone. He turned toward Ella, a strong flash of *deja vu* making him feel unreal. Ella's face was blank. She was staring past him at nothing.

"Ella?" She did not respond. She was remembering the many times in their past when some crucial or tender moment had been destroyed by a call such as this. Her lips moved silently as she recalled her earlier words: *Things will be just like before.*

Her mouth shaped another word: *Better.* She had said that, too. Her eyes snapped back into focus. "Go," she said, digging her fingers into his shoulder.

Marchey's relief was obvious. His eyes flicked to Dr. Chang's image. "You heard?"

Dr. Chang's face showed a new hope. "Yes. Thank you—both of you."

"Now how do I get—" Ella gripped his shoulder even tighter, hurting him. He turned toward her.

"I'm going with you. I know the way." The look on her face defied him to argue. He did not plan to.

He met her gaze. "Good." He now knew how Ella was going to learn what he had been holding back. The end of that particular suspense gave him no comfort. This might be the best way—but would it matter?

He pushed all of those thoughts to one side. There was no turning back, not for any of it. Another choice had left his hands. He stood, Ella rising beside him, and shot a last glance at the image hovering over their half-eaten dinner.

"We're on our way."

"Your Dr. Marchey has quite a reputation inside the medical profession," Dr. Chang said, pouring tea into two cups. She glanced over her shoulder and smiled at Ella. "And please call me Carol."

"All right—uh, Carol." Ella had wanted to dislike the woman who had ruined her reunion with Marchey, but found that she could not. Instead she had to restrain herself from asking the woman to sit for her then and there.

The Head of Ixion Medical Services was just barely five feet tall, flawlessly proportioned, graceful, and an almost

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perfect genotype. Though she had to be pushing sixty, the years had treated her well. Ella's artist's eye subtracted her crisp white coverall and the small silver crucifix worn outside the coverall's blouse, added colored silk robes and saw one of Hiroshito's exquisite porcelain figurines come to life. Yet for her looks she gave off a warmth and air of understanding that invited confidence; Ella had already told her more of her and Marchey's relationship than she would have thought possible.

As for Marchey, he might as well have been in another room. He had asked to see the young accident victim's medical records and test reports just moments after he and Ella had reached Dr. Chang's office, and he had been hunched over the Doctor's terminal and oblivious to all else since.

Ella caught the spicy fragrance of the tea when Dr. Chang handed her a teacup and smiled at her. With Ella seated and Carol Chang standing, they were eye to eye.

"There are only a handful of Bergmann Surgeons as yet," Dr. Chang said, "Your—ah—friend is one of the best of them. His name is mentioned quite often in the medical journals, and his being onStation at this time is the answer to a prayer. His special skills are Shei's only hope."

Ella frowned slightly, looking over the rim of her cup. "You mentioned that term before—Bergmann Surgeon. What's that mean?"

She did not hear Marchey's breath catch at the mention of his specialty. He risked a glance at Ella and saw that her attention was on Dr. Chang.

Dr. Chang's eyes widened and her composure slipped. There was an uncomfortable pause before she asked, "You don't know?" She took a sip of her tea, her movements suddenly jerky and uncertain.

Ella was clearly puzzled by her reaction. "Gorey has always been a surgeon—is this different somehow?"

The silver cross Dr. Chang wore described a glittering arc as she turned away to hide the trapped look on her face. Marchey spoke up then, and she turned toward him gratefully. Ella turned to face him as well, her face showing her unease. She couldn't understand why her question had provoked such a reaction.

"I must see the child now." He looked grim. "Ella, I want you to come and watch—there's something you don't know about and should see." He spoke commandingly. His uncertainty and apprehension showed only in the way his gloved hand strayed to the silver metal pin he wore. Ella noticed the pin for the first time, but got no chance to ask about it.

Dr. Chang started toward the door. She moved like she was trying to get away from something that could catch her only if she broke into a run or looked back. "This way, please."

They followed, Marchey moving with a businesslike briskness that belied the way he felt, Ella trailing behind uncertainly.

The brightly lit, antiseptic-smelling room made Ella uneasy. She did not want to think about the kind of things done in such a room. Her unanswered question left her feeling off-balance, and she had a feeling that the strange

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distance she had sensed in Marchey was about to end—and not pleasantly. When she saw the small, white-swaddled form on the table in the center of the room, took in the tangle of tubes and wires and the crouching medical arcana, she wanted to turn and leave. There was nothing here she wanted to know about.

Yet she stayed. She hovered near the door and her hands worried and plucked at each other nervously. Her question remained: *What was a Bergmann Surgeon?* The answer felt like a threat.

Marchey went straight to the table, his face intent. He began his initial examination in silence. Dr. Chang dismissed the attendant and started toward the table. Marchey waved her back without turning.

"Will the secondaries take over if I unplug her for a moment?" he asked over his shoulder as he checked the pupil of Shei's eye. Her other eye was too damaged to check. He shook his head at what he saw in that good eye.

"Yes, it's a full table."

Marchey nodded absently at Carol Chang's answer, then sighed and turned to look across the room and meet Ella's eyes.

Ella took an involuntary half-step back at the look on his face. It seemed to say a sad farewell. He wore the face of a condemned man, despairing and apologetic. She wanted to go to him and take his hand, he looked so forlorn.

Marchey's eyes dropped in something like shame and he pushed up his sleeves. He began to strip off one gray velvet glove. The fabric came away and underneath it his forearm was silver. His wrist was silver. His hand—palm, thumb and fingers, was silver; metal sculpted and polished, metal shaped and jointed to mimic the flesh and bone it had replaced. He pushed up his other sleeve and removed his other glove, his already-revealed hand winking in the light as it moved like a thing alive. His other hand and arm were the same, a mirror-twin of the first. His face burning, he studiously avoided Ella's shocked and uncomprehending stare.

Ella started foward, protest filling her chest to the bursting point. Dr. Chang restrained her, speaking quietly but firmly.

"Not now—please. Wait until he is done."

"But his hands, what happened to his—" She swallowed and fell silent as she saw him hold up one gleaming hand and the tip of one finger open and extrude an implug with a faint click and whine.

Marchey gently probed the base of the girl's skull, pulled the impline linking her to the table's life-support and monitors, then plugged the implug dangling from his finger into Shei's tap. The back of Ella's neck itched in sympathy. She watched him stand there, swaying a bit, to all appearances daydreaming.

Dr. Chang spoke up before Ella could voice her question. "He's linked now to Shei's tap. Most imped doctors can do that, but only by using a special interface. He can read more and his interface is in his prosthetic." Ella mouthed the word prosthetic, staring at the silver hands. It tasted like tinfoil against tongue and teeth.

There was a soft snick and Marchey's hand withdrew after reconnecting the child to the table. He then placed a hand

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on either side of her head and moved them in a slow circular motion, keeping his hands parallel to each other. They hummed loudly in the still white room.

"Now he's scanning the location of the fragments. He does not have to do this—we've taken full scans—he's just being careful."

Ella watched intently, scarcely hearing Dr. Chang. Her attention was welded to the alien, argent metal that replaced the gentle hands she remembered. Marchey seemed lost to all but his work.

At last he straightened up, muttering something under his breath. One silver hand brushed the dying child's forehead tenderly.

Something clicked inside Ella. She was suddenly assualted by a flood of jump-cut, staggeringly vivid sense-memories of Marchey's hands touching her, his hands softly stroking her cheek, his warm palms and fingers cupping her breasts, thumbs and fingers caressing, knowing where to go and how to move as if possessed of a wisdom of their own, his hand in hers in the dark, comforting and reassuring . . .

But those hands were gone. *Gone*. Her skin crawled as she imagined those terrible cold metal *things* touching her.

"—gone . . ." Ella started toward the table, toward Marchey. Dr. Chang again held her back.

"Please," she said evenly, keeping herself between Ella and Marchey. "Don't break his concentration." Her voice became more urgent. "Shei's life depends upon it."

The pleading note in Dr. Chang's voice reached Ella. She swallowed hard, meeting the other woman's eyes, then nodded after a moment. Her gaze went back to Marchey. Dr. Chang turned to watch as well, staying close to Ella.

Marchey stepped back from the table. He crossed his arms before his heavy chest and began to breathe deeply, eyes closed, in some sort of *pranayama,* or breathing exercise. Ella watched, bewildered, as his silver hands fluttered and flashed like mechanical birds in rhythm with his breathing. His face became increasingly strange as his breath slowed, all expression flattening away to leave a rigid, almost inhuman mein in its place. The seconds limped by and his face became colder and stranger again.

Ella felt a terrible dread stir inside her. She sought the comfort of Dr. Chang's hand against the cold creeping fear moving up her back, a fear that wrapped itself around her with clammy spatulate hands. Dr. Chang's hand was cold in hers—was she afraid as well?

Marchey's eyes opened. But there was nothing of the Georgory Marchey she once knew and loved to be seen in them. They belonged to a stranger —perhaps not even a human stranger. They were dark caves suited to a lurking monster, empty of light or laughter. She had to struggle with herself to keep from running away from this awful stranger that Marchey had become.

Staring straight ahead and seeming to see nothing, Marchey moved to the foot of the table with slow, ratcheting steps. He bent like a badly made puppet and rested his forearms on the table; palms up, elbow to wrist flat on the padded surface. The clockwork birds of his hands did not move. His awful, unreadable eyes closed. He drew his breath

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through his clenched teeth sharply, as if lifting an impossible burden.

His breath came out in a long hiss and he stepped back, straightening up slowly.

His silver arms still lay on the table, lifeless and abandoned, gleaming and somehow obscene. Just below the joints of his elbows his arms ended in featureless silver plates. Below that there was nothing.

Ella stiffened, her face white and immobile as carved bone. Dr. Chang held her hand tightly. "It's all right," she whispered, her tone thin and uncertain. Ella said nothing, staring at Marchey, her lips pressed together as if to keep in a scream.

Marchey moved like a sleepwalker toward the head of the table. Once there, he brought the truncated stumps of his arms down toward the child's head as if his arms remained. He looked like a bird of prey ready to feed.

Had his hands still been there, they would soon have been past the skull's bony case and buried deep in the delicate tissue of her brain. He changed position slightly and the silver plates winked knowingly. His eyes were again closed. His face showed no more animation or humanity than a granite gargoyle. He looked *evil*.

Ella forced a question through her set lips. "—what is h-he?" What is he doing? *What is he?* Two questions out of a hundred, more.

"He is locating the fragments," Dr. Chang replied softly. She licked her lips, then continued, "Since it is metal, he will trace each path of entry and bring each fragment out along its path so that no more damage is inflicted by its removal."

Ella's bewilderment was total. "But he doesn't h-have any h-hands," she stammered, turning toward the older woman. Tears ran unnoticed down her face. "Someone took his h-hands, his beautiful beautiful hands—"

"He has something *better!*" It sounded almost like a shout when Dr. Chang spoke. She squeezed Ella's hand tighter and spoke softly, reassuringly.

"Listen Ella, there is a phenomenon common among amputees called the 'phantom limb.' That means that they can still 'feel' the missing limb, that something remains although the limb is gone. The strength of the feeling varies from person to person; some do not experience it at all.

"A very great man, Dr. Saul Bergmann, studied this phenomenon. He found that less than a hundredth of one percent of those who felt that phantom limb could actually manipulate matter with that *limb image*. The ability was so weak and wildly erratic that it took him several years to prove conclusively that it existed. But he *did* prove it, and also proved that with practice and special training this ability would grow stronger and under better control."

Ella stared at the doctor. There was no sign that what she was being told was reaching her, and every so often she would take a brief, unhappy glance at Marchey.

"These few very special people could do many unexpected—seemingly *miraculous*—things with this limb image once they learned to find it and encourage it. But the most amazing thing discovered was the changes it could

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cause and the things it could do inside the human body. Impossible things. Wonderful things. Bergmann Surgery came out of a growing understanding of—''

Ella had turned to look at Marchey and a small shocked sound escaped her. Dr. Chang turned to look, just in time to watch a jagged fragment of metal slowly emerge through the gauze covering one of Shei's wounds. It poked out apparently by itself, twisted free of the threads, hung there a second, then lay on the white bandage. A small bloodstain spread slowly away, darkening the clean gauze.

Marchey was oblivious to being watched by them. Sweat sheened his forehead. A silver-capped stump turned toward his head momentarily and the sweat vanished. He shifted position slightly and continued to work, the silver plates dancing over the child's head.

Ella shuddered and turned away; this was worse than knives and bone-saws and a rubber-gloved hand coming up wet and red. Dr. Chang whispered, ''Dear God,'' under her breath, her eyes shifting from Marchey to Ella. Ella was drawn to look at Marchey again, compelled by a will-defeating mixture of fascination and revulsion. She saw—but did not understand—the Marchey-thing laboring under the bright lights. What had he become? How? Why?

Dr. Chang continued to explain what was going on, but she no longer addressed Ella directly. She may have been speaking as much for her own benefit as the younger woman's. She held Ella's hand, her other hand on the cross hanging from her neck.

''Miracles . . . as if God had made them so that his work could be done through them, by them. He can wipe away a tumor or clot with a touch, can restore damaged or destroyed cells. He can coax an aneurysm out, smooth it away as if it were a bubble in clay, can thrust his hands into a living beating heart without breaking the skin or changing its beat. Bone, sinew, muscle, or organ, it is all as clay to him. The strongbox of the skull presents no more barrier than the surface of water to him; he can reach through it to touch what lies beyond and work inside as easily as you or I could turn over stones in the bottom of a fishbowl. No scars, no complications, no pain. . . .''

Dr. Chang fell silent and faced Ella, turning her pale face toward her, overcoming the younger woman's resistence. ''I *envy* him, Ella—can you understand that? Soon all of my skills will be as obsolete as electroshock and leeches. Surgeons will be like *him*. They will be—'' She paused, trying to find the proper word.

''—magicians, Ella. Shamen—miracle workers. Compared to what your Georgory has become, I am just a crude mechanic. He is a *healer!* He is not a monster or a cripple, girl; he is the man you said you loved.'' She squeezed Ella's hand harder. ''The man you love.''

Ella's face was ghastly. She looked like she had been bled to within a handsbreadth of death, her face like chalk.

''But how did he lose his hands? *How?*'' Her voice was thin with bewilderment. She shoved her hands under her arms as if to protect them from the same fate Marchey's had suffered. ''How

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was he *m-maimed*? He never told me about any a-accident—''

Dr. Chang answered, never stopping to think about what a terrible thing truth can sometimes be. ''There was no accident. He took the Bergmann Tests and scored high enough to be considered. He took the preparatory training, and once it became clear that he had something of the innate ability needed, he gambled on success and had his hands amputated. God, I'd trade mine if—''

Ella stared at Dr. Chang in absolute horror, her mouth working soundlessly at the word *amputated*. She lurched back clumsily, her eyes searching out Marchey. She took one terror-filled, horrified look, then turned and fled. The door swung shut behind her, closing on a scream.

Dr. Chang stared at the door and made as if to follow, but did not. She turned toward the table slowly, only to see another twisted fragment of metal worked free by a spectral hand.

''Dear God,'' she whispered, watching. She took a step closer, then another. She never voiced the name of whom she was praying for.

Oblivious and unmoved, Marchey worked on.

Marchey seemed embarrassed as he reattached his silver arms under Dr. Chang's awestruck gaze. He did not ask where Ella had gone.

Some subconscious, then-volitionless part of his mind had registered all that had happened. Ella's absense left a dark hollow space in his chest, a space that would soon fill with something worse than that gaping emptiness. Time would see to that.

He sighed. ''I don't think that there will be anything worse than a small memory loss—I was able to repair most of the damage. You know the tests to run.'' His tone was as mechanical as his silver hands. He was unwilling to look up and meet Dr. Chang's eyes.

She nodded soberly. ''You saved her life. You healed her face, too.'' Her voice throbbed with awe.

She had seen the bandages come away from Shei's face by themselves, revealing the lacerated, hastily sutured flesh beneath. She had seen chipped bone replace itself and damaged veins snake together and reknit. She had seen a damaged eye become whole again, had seen subcutaneous tissues move like hot wax, flattening, filling, and sealing. She had seen lacerated—*shredded*, and burned skin reshape and return to its earlier state as water stills after a disturbing hand is withdrawn. At the end of it Shei's face showed nothing of the gross insult it had suffered.

Dr. Chang had witnessed something that seemed to go beyond mere medicine into the realm of God's miracles. She did not seem to be able to keep herself from maintaining a careful distance from Marchey. He sensed this, had been expecting it since he had seen the cross the woman wore, and did not press her. He had been there before, been there many times. It was just one source of his despair.

He shrugged uncomfortably, glancing at the peaceful, now-unblemished face of Shei Sinclair. *A life for a love*. May she live long.

''She's very beautiful. Plastic surgery would have left her scarred and there was no reason to let her be disfigured.

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She will probably be out for another hour, then wake up almost good as new —though I'd test her hearing. I'm— uh—glad I was here to help." He looked away, his head hanging and eyes downcast, unwilling to try to meet his colleague's eyes. Had he tried she would have flinched away.

Fear, revulsion, blind hatred, or —worst of all—a terrible theistic awe; it was always one of these or a mixture of them in the faces of the medical people he worked with. Always.

Somehow *that* was never mentioned in the medical journals. Neither was the relief of those same people when he moved on. There was never an invitation to stay. He had not yet become completely numbed to that.

And now Ella was gone. He hoped that he would be able to find a bottle big enough to crawl into until he drugged himself into a sleep that would be merciful only if it were dreamless.

Marchey shrugged again, pulling on his gloves. He would not be able to bear being stared at right now.

"I guess that's about it." He cast a last, longing glance at the child whose life he had saved, wishing he could stay until she came around. But it was better if he left. Bitter experience had taught him that and taught him well. Some memory of his invasions would remain inside her, and if she woke and saw him she would begin to scream and scream. Several patients had nearly been lost before that lesson was learned.

Dr. Chang took a step closer to him, moving as if he were some beast she feared. "Thank you . . . Doctor." She almost met his eyes. "I-I'm *sorry,*" she blurted, her face filled with shame.

"So am I," he answered heavily. "So am I."

He left quietly, his steps slow and plodding, his broad shoulders slumped in one more triumph, one more defeat; one more life saved, one step further away from life.

The last shuttle back to the inbound supply ship left a week later. Marchey boarded silently, never looking back. There was no one to see him off.

Ella had made no attempt to contact him. Though he had been tempted to try to reach her that he might somehow heal the rift between them, he had not given in to the temptation. Some things were beyond his healing powers and would ever remain so.

Dr. Chang had sent two messages telling of Shei's condition. Her only token of her brush with death was a lingering hearing impairment that was already fading, and nightmares of a handless monster looming over her. The messages were very formal and quietly apologetic. Just before leaving for the shuttle he had composed and sent a reply. It read:

DEAR DR. CHANG: I AM GLAD THAT THE CHILD IS WELL AND WANT YOU TO KNOW THAT YOU ARE BLAMELESS. WHAT HAPPENED WAS PROBABLY INEVITABLE, AND AT LEAST A GOOD CAUSE WAS SERVED. BUT PLEASE BE CAREFUL OF WHAT YOU WOULD GIVE UP OR ENVY. A DOCTOR MUST MINISTER TO PEOPLE AS WELL AS JUST THEIR BODIES, AND FOR ALL THAT I HAVE SEEMINGLY GAINED, I HAVE LOST EVEN MORE. I HAVE LOST THAT PRECIOUS CONNECTION WHICH MADE ME WHAT I WAS—AND MADE ME GOOD AT IT. I AM NOW FAR LESS A DOCTOR THAN I WAS BE-

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FORE. I HEARD WHAT YOU SAID, AND YOU HAVE IT BACKWARDS. I AM THE MERE MECHANIC NOW. —MARCHEY.

He settled back into his seat, the red edges of a headache beginning to hammer at his temples. He was sorting through his beltpouch for one of the soporifics that he had become increasingly dependant upon when the shuttle's steward approached him carrying a large, foil-wrapped package.

"Dr. Machey?" He nodded in acknowlegement.

"I was told to see that this package got to you." The steward handed it over. The package was quite heavy.

"Thanks." The steward mumbled a hasty "You're welcome," then sidled away. He had already heard the story of Ella Prime, Dr. Marchey, Dr. Chang, and the healing of Shei Sinclair. Nearly everyone on Ixion had. The romance had become something even more interesting.

Marchey put the package on the seat beside him, then picked it up again, unable to contain his curiousity. The foil came away under his silver fingers. He opened the box.

His breath caught in his throat and his eyes grew wide. It was a bisque-fired clay sculpture by Ella. The piece was exquisitely wrought and powerful; eloquent proof that her fame and wealth were more than well-deserved.

It portrayed two sculptors who had begun work on a single piece, two lovers embracing. But one sculptor stood helplessly by, staring up at the unfinished lovers, his face contorted by grief. He held the truncated stumps of his arms up toward the lovers as if in supplication. His arms lay lost at his feet.

The other sculptor, a woman, huddled on the ground near him, her tools scattered and forgotten, her averted face a torment of frustration and shame. Her face was turned away from fellow sculptor and work alike.

The two lovers were rough-hewn and unfinished, yet they were unmistakably Marchey and Ella. So were the sculptors.

Marchey stared at it for a very long time, tears streaming down his face. When the acceleration warning sounded, he belted the piece into the seat beside him, then turned away with something like sorrow and something like relief. *She understood.* Not that it could help, or change anything, but she understood.

One of his silver hands touched the pin he wore over his heart; silver on silver, metal on metal.

The final warning sounded. The mirror-bright silver hands fell to his lap in what might have been an attitude of prayer and the shuttle dropped back into the vast lonesome night, away from Ixion Station.

Brightflash silver, catching the light.

The silver metal pin shaped so: two hands, crossed at the wrists, arms ending just before the elbows, fingers spread wide.

Some say that the palms and fingers are turned inward to protect the heart they cover. Some say that they are turned outward to connect that same heart with the world. They may both be right.

Only those wearing the pin can tell the truth of it.

But no one asks. They turn their faces away, asking only to be healed. ■

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State of the Art

SCIENCE FICTION IS STILL TOO CONSERVATIVE!

G. Harry Stine

The May, 1961 issue of *Analog*—that's more than twenty years ago—carried my article, "Science Fiction is Too Conservative." It's been anthologized widely ever since, so I must have said something right.

In it, I berated science fiction writers and aficionados for being too conservative in their thinking about the future, for neglecting to keep up with scientific discoveries and literature, for failure of nerve and imagination in forecasting the future, and for writing, re-writing, reading, and voting awards to science fiction that was old-fashioned, conservative, lacking in new ideas, and devoted to a hopeless and disconsolate future of death, destruction, failed technology, and people afraid of and under control of the very technology they developed. The basic plots of most stories could be traced directly to H. Rider Haggard, Herbert George Wells, Edgar Rice Burroughs, and various travel books in spite of John W. Campbell's crusade for stories about real people in well-forecast futures.

Looking back over nearly a quarter of a century, has anything changed? The

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answer, of course, is yes. The only thing we can count on is change.

However, science fiction is *still* too conservative, but for different reasons. And most of it isn't *science* fiction any longer.

Three basic SF story categories exist today: (a) the hard science fiction story, (b) the soft science fiction story, and (c) the sword and sorcery, witchcraft and faeries, dragon and dungeon fairy tales with very little (if any) science content. The dividing line between science fiction and fantasy, never very distinct in the first place, has shifted to the point where a 1961 story that was definitely fantasy is considered science fiction today.

The "hard" SF is as good as it ever was, although it's still based on conservative forecasting. Some authors learned to project physical science and technology at least fifty years into the future. But beyond that, their forecasts are probably as conservative as John Pierpont Morgan's nineteenth century finance and banking practices are on Wall Street today. I'm guilty, too. Although I'm proud that the late Herman Kahn considered me a "technological visionary," many of my forecasts were wrong. My novelette, "Galactic Gadgeteers," published in the May 1951 issue of this magazine, was technically obsolete by 1961 because of developments in solid-state electronics. And, in company with many of my colleagues, I missed the consequences of that modern intellectual tool, the electronic digital computer. And I neglected aeronautical navigation satellites in *Manna*.

So even those of us who try hard to do forecasting for SF stories still miss the boat twenty years after I complained about it.

However, there's been a paucity of seriously forecast stories involving biotechnology and psychotechnology in spite of a major shift in acceptable story content.

An editor once told me that science fiction, in common with many other things, "isn't worth a damn unless it's hard." That remark exemplifies this change in SF over a twenty-year time span. Off-color scatological talk, profanity for shock value, and a certain amount of sexual kinkiness is now acceptable. However, we now have a healthy acceptance of mixed-gender crews and females as leading characters. My concern is something Heinlein warned me about in 1950: don't drag sex in by the heels for the sake of sex. It's got to be a natural part of the story. I happen to be one who prefers not to be explicit but to titillate the reader's imagination. This can be extremely effective if the reader can fantasize.

Few authors have made the synthesis between advanced biotechnology and sexual mores, even though we went through a decade during which biotechnology caused a moral revolution. But what are the personal and social consequences of forecastable biotechnology that could affect sexual relationships in the future? Although the current controversies over sex-change, birth control, test-tube babies, and host mothers were

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indeed discussed in science fiction long before the actual biotechnology became available, some of the potentials for other forecastable biotechnology have *not* received attention by science fiction writers, and we *should* be looking at the consequences because no one else is going to.

And there's very little SF written today around the fascinating new data in parapsychology. Most people simply refuse to believe the data. The history of science and technology leads one to conclude that some of the debunking of *The Skeptical Inquirer* isn't valid. There's a growing mass of data that can no longer be dismissed.

For an interesting mental exercise, assume that today's "fringe" sciences, "proto" sciences, or "parasciences" develop into the technologies of the next century much as nineteenth century electromagnetism developed into today's computers and communications technologies. Work out the technological basis for such developments, being careful not to render invalid what we today know to be true—i.e., the basic theories of science will change in the future, but the technology of today will also work tomorrow, albeit with improvements.

The "soft" SF hangs on threads of what Heinlein calls "the fuzzy subjects"—i.e., the "sciences" that will not pass the Schwartzburg Test ("The validity of a science is its ability to predict. —Harry L. Schwartzburg, RCA, ca. 1960) and can be mastered solely by scholarship. Some of this has been passable entertainment, but the authors usually have futuristic technology existing alongside ancient institutions.

Science fiction authors exhibit a surprising lack of imagination when it comes to future institutions.

An institution is a group of people. It's organized for a purpose, follows rules, and has a structure or hierarchy, the simplest being that of a leader and a few followers. In its most complex forms, it's a worldwide group of nations or corporations. It depends upon effective communication and a host of other supporting technologies. The larger the institution and the more people it encompasses, the greater the amount of energy that must be used to operate it. Today, institutions are created by people to control the human use of technology which in turn is developed in response to human desires. And, in turn, technology permits these institutions to exist.

We still suffer SF stories of the future based upon institutions of the past—i.e., planet-wide kingdoms and interstellar empires complete with beautiful princesses, absolute monarchs, dastardly black villains, and white knights errant.

An interstellar empire based on the Persian Empire of Darius can't possibly work. But no one has figured out *how* an interstellar institution might be organized, if at all. Or why.

The easy way out is to assume the main governing body is an elected Council of elders. That didn't even work very well for the classical Greeks. It barely works for the United States of America. Will it be any better even if computers are substituted for human

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beings? Designing institutions is something we're not very good at yet in SF. We tend to resurrect institutions of the past that have either been ruled by impulsive teenagers with little experience or old men who had enough experience (not necessarily wisdom) to maintain the status quo.

Advanced technology *can't* be handled by primitive institutions. A nomad tribe cannot successfully operate an international airline without technological help from outside.

Recent history indicates that technology creates the institutions to control it. Chemical, biological, and nuclear warfare technologies have done so. Perhaps if a technology doesn't create its own institution, it may become a stillborn or useless technology.

It seems everyone has mouthed the shibboleth that the social sciences lag technology. Has anyone ever observed that this has been and probably always will be so? And has anyone ever asked why?

When an SF writer invents a future culture, it may not be viable because it hasn't been thought through. Admittedly, this is a difficult task. I'm not sure I've succeeded when I've taken a cut at it in *The Abode of Life* and *Manna*. The late John W. Campbell once started a controversial project that was battered back and forth in "Brass Tacks" for months: write a constitution for Utopia. It's still a good idea. Maybe it should be tackled again. Authors and readers both could use the practice.

My 1961 criticism that "science fiction is tired old doomsday literature" still holds true. One gets weary of downside scenarios when, in the real world, there are no historical precursors for them from a teleological point of view. For example, the fall of the Roman Empire was accompanied by the rise of the Orient that culminated in the glory of Islam whose science, technology, life style, quality of life, and civilization led the world while Europe wallowed in the Dark Ages. Cultures are cyclical, as James Michener has shown in his novels. There's no such thing as stability, only change with continual long-term improvement. When one group is on top, another's on the bottom while a third is scrambling up the greasy pole, nipping at the heels of the top group. C. Northcote Parkinson, better known for his famous Law, was Raffles Professor of History at the University of Malaya and wrote an outstanding book, *East and West*, concerning the cyclical nature of history. There are more.

Some people claim that a downside catastrophic scenario is plausible now because we never had the thermonuclear bomb before. However, there are a large number of thermonuclear war scenarios other than the "world catastrophe" or "spasm war" scenario that's been almost exclusively considered. Most people are so frightened of nuclear weapons that they've never studied the available information. They believe that any general thermonuclear war amounts to the generals suddenly pushing all the buttons at once.

It's possible to survive a thermonuclear holocaust. First of all, there's Heinlein's Defense against a nuclear

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weapon: "Be where it ain't." The late Dr. Willy Ley: "There will always be survivors." Read Dr. Dean Ing's novel on surviving a thermocuclear holocaust. And civilization is surprisingly resilient. It rebounds from disaster faster than many believe possible. Hamburg, Dresden, Berlin, Tokyo, and other cities were flattened in 1944-1945 by non-nuclear "iron bombs." When I was in Frankfurt in 1974, I couldn't tell it had been totally demolished by bombing and shelling thirty years before, although old photographs told me so. Hiroshima and Nagasaki have been rebuilt so you wouldn't know each had been treated to the One Second Slum Clearance Program in 1945 unless you deliberately sought out the memorial at Ground Zero.

There's been some concern, however, that it would be difficult to survive a "nuclear winter" scenario that some scientists have predicted would follow a general thermonuclear war. This scenario remains speculative at best because it is based upon admittedly incomplete models of the atmosphere and dependent upon a very large number of fortuitous occurrences. The planet Earth is *very* large and its atmosphere is *very* dynamic. Few people and fewer SF authors have a grasp of the size of this "small planet" and its restless atmosphere. Even if a situation arises in which the scenario were wholly valid, human beings are very tough organisms; there will be survivors.

Serious students of warfare rate the chances of an all-out thermonuclear general war today at less than one in a hundred and improving constantly. It's time people re-read *On Thermonuclear War*, *Thinking About the Unthinkable* and *On Escalation*, all by the late Herman Kahn. The potential adversaries may be reviling one another in the media, but they're still talking and improving their means of communication all the time.

But this isn't a treatise on warfare, although most science fiction authors who write about the social activity called war and its consequences could use some tutoring. There are few SF writers who have any knowledge of military history, military doctrine, the art of warfare, the principles of war, or the international law of armed conflict. An SF writer couldn't sell a story in which the physics or chemistry were incorrect. But it's possible to get away with anything when writing about terrestrial, space, or interstellar war.

Back to the main subject: Looking ahead is admittedly difficult. It's so hard to make a rational forecast of anything—especially science and technology—more than fifty years in the future, that most writers give up in frustration. Others never try. Therein lies a problem:

Today, there's too little science in what is called science fiction.

But there's a lot of imagination!

I'm not alone in perceiving this. Robert Silverberg, an outstanding and prolific SF author who's also a Nebula anthology editor and is therefore aware of what's being written and what's winning awards, commented about this in a recent editorial for another magazine.

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Why does some modern science fiction lack science?

There may be several reasons. Let's hypothesize . . .

Twenty-five years ago, most SF authors either had a degree in science or engineering, had come up through the technician ranks, or were self-taught science and technology buffs who pursued scientific-technical hobbies. They also understood the history of science and technology as well as how trends in these areas behaved. Today, many people became SF writers without learning about science or technology. They have a greater tendency to follow scientific fads, don't have the necessary disciplinary background to evaluate these fads properly (much less data and trends), and don't understand our technological civilization. They are like John in Robert Pirsig's *Zen and the Art of Motorcycle Maintenance*, a person who lives with technology because he has to but otherwise wants absolutely nothing whatsoever to do with it.

This has led to an enormous proliferation of sword-and-sorcery stories. Insofar as the s-and-s category goes, it's grown beyond expectations for what appear to be two reasons:

1. Female human beings like it and buy it. This has expanded the SF book market. The creation of a bigger pie has been attractive to publishers. They publish what people will buy. I'm glad. I don't want some bureaucrat deciding it.

2. Today's generation of young SF readers apparently didn't have fairy tales read to them when they were children. They grew up in a period of nonsense when psychologists maintained that the sex and violence in fairy tales were harmful to innocent young minds in their formative periods. These psychologists didn't realize that fairy tales are morality yarns and are, to some extent, distorted stories about our development as a civilized species. In fact, one shouldn't be overly upset—as the Surgeon General of the United States was—at the violence inherent in video games. Children and teenagers are violent individuals. So were our ancestors. Ontogeny recapitulates phylogeny. Would you rather they released their violence with clubs in the streets instead of with joy sticks in video arcades? And why do you think it's called a joy stick in the first place? Psychiatrist Dr. William B. McGrath believes that video games are a substitute for masturbation. But I digress, although I couldn't have written these lines for this magazine twenty years ago.

If you can find an un-purged edition of Grimm's or even Hans Christian Andersen, you may be apalled by the sex and violence therein. A lot of modern s-and-s resembles these fairy and folk tales. Not to worry. Grimm and Andersen are in the public domain. Since few people are familiar with them, an s-and-s author can file the serial numbers off the old stuff and put new serial numbers on because only a few people like me will know.

Some authors do a good job with s-and-s stories because they don't take themselves or their stories seriously. Only the fans do that. I enjoy s-and-s

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yarns where the author attempts to offer a rational explanation or hypothesis for the magic therein. One can hope for more stories like Heinlein's *Waldo, Magic, Inc.* and *Glory Road.* Or Williamson's *Darker Than You Think.*

Sword-and-sorcery may have become popular for another reason. Primarily because of the plethora of half-hour western, police, and pseudo-military television shows, sex and violence are in. Talk and intellectual discussion are out. Don't talk about it. Don't reason out the solution. Solve the problems with action or some sort of kinky killing method. I was fascinated by the viewer reaction to the 18-hour mini series, *The Winds of War.* I felt that novelist Herman Wouk had done an excellent job on the TV script. But as a television show using many of the novelist's techniques, it bored viewers who were used to seeing a complete story wound up in a neat, simplistic package in thirty minutes or an hour.

As a result, some editors demand sex and violence, whether the SF story be hard, soft, or s-and-s. I've been testing this sex-and-violence hypothesis. In one of my novels, there are four acts of violence in the first four chapters. But when I wrote non-explicit zero-g copulation into a novel as a natural consequence of the story, an editor edited it out. So maybe I'm only 50% correct.

Finally, there's been a greater tendency in science fiction since 1961 to belabor the problems caused by the applications of technology while ignoring or neglecting to propose valid solutions. The easiest solution to misuse of technology is obviously to ban that technology. But how is this possible in the real world? There's no indication and no history to confirm that at any time in the past we've been able to ban, hide, or forget technology.

Dr. Daniel J. Boorstin, the Pulitzer-winning historian and Librarian of Congress, writes in his book *The Republic of Technology* that "the hallmark of the great technological changes is that they tend *not* to be reversible." Political change can be reversed for a short period of time until social pressures force another change, whereupon you "throw the rascals out" for another set of rascals. In the social world, you *can* go home again for a short time, but you probably won't like it.

Science and technology are the cornerstones of a civilization that's taken 5,000 to 10,000 years to develop. They shouldn't be whipping boys. We cannot survive without them. Nor can we afford to start over from Square One again. Authors, editors, and publishers do serious injustice to an important method of working out future options by popularizing sword-and-sorcery medieval fairy tales as science fiction; sell it for what it is. Or by feeding the fear of the future and the unknown through downside SF. A downside anti-technology SF scenario is easy to work out, easy to write because there's so much stuff waiting for the serial numbers to be rubbed off, and easy to sell because it can be hyped using fear tactics.

Yes, it's a living for us SF authors, and we must respond to market desires. But we can also create them. Rather

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than writing about the downside consequences of technology out of control, science fiction authors should attempt to gain a better understanding of science and technology, its development and history, how it works, how it fits into the future scheme of things, and how we could go about *solving* the problems that we face rather than wallowing in them. There are lots of exciting stories there. Positive SF will indeed sell. Look at *Star Trek*. Medieval fairy tales masquerading as science fiction don't help us work out viable options and scenarios to solve the problems of using and controlling technology. That world has gone away and won't come back, thank heaven. We have many important decisions regarding technology that are going to have to be made because we can forecast that the technology is coming, like it or not. We must assume we're going to survive and won't be able to run away from it.

We can't close the Pandora's Box of technology. Technology is never forgotten; it's only replaced by better technology. Because we can't put the thermonuclear bomb, recombinant DNA, and a host of other technological wonders back into Pandora's Box and forget them, we must deal with them. It's not easy. But we have science fiction as an experimental laboratory in which to investigate the options.

I share a vision of the future with the late Herman Kahn:

> *A hundred years from now, barring an incredible combination of bad luck and poor management, people everywhere will be many, rich, and largely in control of the forces of nature.*

I've got faith in the capabilities of human beings. We'll make it. Therefore, we must learn how to be rich and handle abundance because we've never had to do it before. The problems we face in getting there, how we get there, and how we handle the problems we'll face when we get there can make fascinating science fiction stories.

If science fiction doesn't accept this grand challenge, it will become the "historic," classic literature of the twentieth century. And something else will take its place: a form of literature that does indeed address the options for a technological civilization that admittedly has lots of problems but is also continuing to make things better for more and more people.

By the time I write the third part of this in 2005, we'll know. ■

A. BERTRAM CHANDLER, 1912-1984

A. Bertram Chandler, author of many stories appearing in *Astounding* and *Analog* between 1944 and 1970, died on June 6, 1984, following a heart attack at his home in Australia. He was perhaps best known for his "Rim Worlds" series, drawing on his own extensive experience as a merchant seaman, and for the much-anthologized "Giant Killer."

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on gaming

Dana Lombardy

A new wave of computer games is upon us. These games are based on familiar SF and fantasy novels, and include famous authors, such as Fred Saberhagen and Isaac Asimov. Translating SF novels into games has been done for years—but not on a computer format.

Board games, such as *Dune* and *Fellowship of the Ring,* and role-playing games, such as *Call of Cthulhu* and *Star Trek* have been very successful. How well will these new computer games do? Some will be mercifully ignored. But a few deserve to be taken seriously and played. *Wings Out of Shadow* is one of these games.

Fred Saberhagen's series on the Berserkers is one of the most popular in SF. *Wings Out of Shadow* by Baen Software is named after one of Saberhagen's short stories about the robot Beserkers. It's a solitaire game for the Apple IIe and Apple II+ with 48K ($34.95 at your local software store, or direct from Baen Enterprises, 8 West 36th Street, New York, NY 10018).

Long ago in another galaxy two alien races met and fought a war of mutual annihilation. The legacy of that war is the weapon that ended it—and obliterated all life on both sides. That weapon was the Berserkers. Berserkers are intelligent space ships about the size of a small asteroid. Their mission is to seek out life wherever it exists or hides—and destroy it. After a thousand-year campaign that cut a swath of death across the Milky Way, the "devil machines" have entered the area known as the Empire of Man.

In *Wings Out of Shadow,* a hospital spaceship, the *Hope,* is being escorted by the carrier *Judith* with its reduced complement of nine small fighters. The *Hope* carries survivors of an attack on the planet Yaty by the dread Berserkers. The humans try to flee and the Berserkers give chase. This is where you enter the story—through the game. The object is to get the *Hope* to safety and destroy as many Berserkers as possible. Neither task will be easy.

There are actually four games provided in *Wings Out of Shadow,* each game designed by a different programmer. The first part is called *Pulpit* and is a simple arcade-style shoot-and-dodge game. If you do poorly here, you could lose some fighters and this does carry over to the next part of the game. *Pulpit* may be too simple for an experienced gamer, but it gets you warmed up for better challenges to come.

The Bridge is next. It's a strategic-level design with almost no graphics. You must type in orders in response to information you're given in the

(continued on page 145)

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Joseph H.
Delaney

PAINKILLERS

Human motivation
is based on feedback:
one strives in
proportion
to the perceived
difference between
what he has and what
he wants.
But if perception
doesn't
match reality . . .

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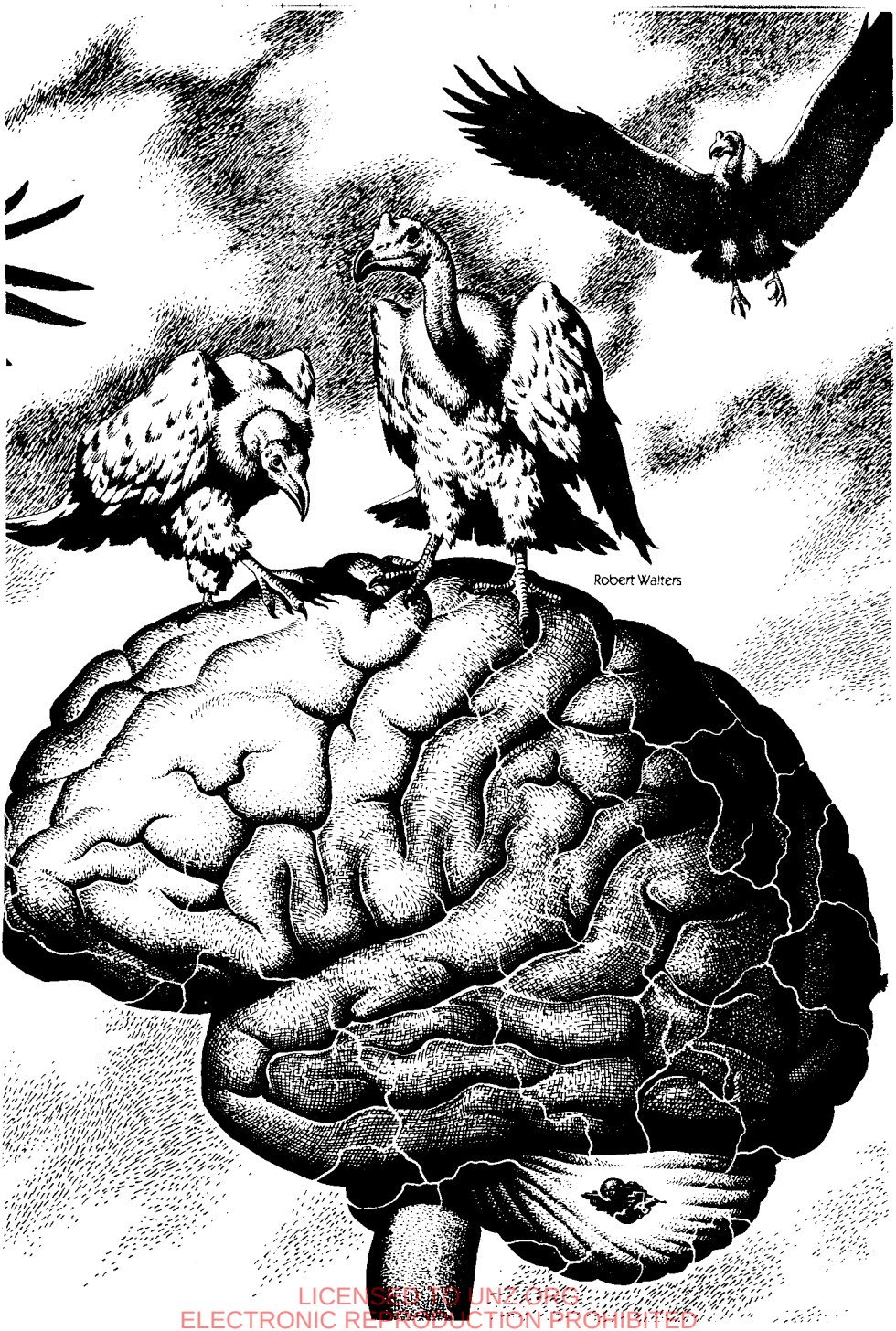

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2:00 A.M.—Wednesday, May 5, 2026—University of Texas, Nacogdoches.

"Olaf! Come here! Look at this." Helga was dripping wet, clad only in a towel, and had left a trail of puddles all the way from the shower to the cluttered laboratory.

Olaf grunted an acknowledgement but did not rise from the cot where he had hoped to snatch a few minutes' sleep. He had been awake for almost two whole days while the two of them tried to keep track of the activities of almost a thousand cultures that comprised the experiment they were conducting.

"Olaf! Come quick. Don't be lazy. You wouldn't believe what I see."

This time he rose, rubbed his eyes and muttered, "Coming." And it seemed to him that he had made a grevious error to marry another geneticist. A single man might have gotten some rest.

He found Helga bent over a split screen display. As he watched, the screen divided again, and then once again, until there were eight separate images in as many compartments, all fuzzy, but all in furious movement. "What's wrong, Helga?"

"Wrong? Nothing. Things are finally right. Bottom row—two over from the left—look." She punched a button. the other sections disappeared, and the one remaining enlarged. Helga twisted a knob, and the machine electronically 'stained' the image.

Olaf watched only an instant before he became wide awake. In the image some of the tiny dots and fragments had found company; were joining up with one another, like a group of square dancers in a frenzied romp. Chains were forming, twisting, knotting. Olaf was elated: "Helga, we did it!"

"Uh-huh—maybe, maybe we did it. I'll admit it looks encouraging, but what if they don't lock?"

"Let's quit wasting time and find out." He pushed a few more buttons, flashed the sample number on the screen and got its location. "You'd better get dressed," he said. "I think we're in for another long night."

That prediction proved correct, but somehow, neither of them felt the fatigue that should have paralyzed them. The adrenalin simply flowed too copiously. All night long they watched sample ADX-2294-ZIC-9, and it did not disappoint them.

It continued to grow, longer and longer, far beyond what they needed to begin testing its properties, so they stimulated it with a weak current, causing it to fission, and then while one segment remained in the medium to grow some more they worked on the other.

By dawn, they knew they had it, had it all: a self-assembling protein with specific and predictable electron flow, one that would faithfully reproduce itself, every time, in any quantity; and more important, one that contained precisely the proper chemical hooks to attach to natural proteins. Their final test was a revelation: a bit of tissue from the cortex of a mouse brain, swimming in nutrient, produced a sort of "weld" as the synthetic protein locked itself into the molecular lattice of natural protein precisely at the optimum location.

Olaf looked up from the screen, met

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his wife's astonished gaze head on. Two faces broke into smiles simultaneously.

"There is only one other question to resolve," he said.

"What's that?"

"Do we call a press conference now, or do we go to bed and do it in the morning?"

They went to bed. The world had been without a synthetic biochip for its entire history. The news that one now existed could wait another eight hours to break.

1300 hours—Sunday, August 10, 2031—De Groose Galleries, Rotterdam.

Adrian Chace stood in the shadows, behind a massive papier-maché caricature of himself, and looked out at the crowd of admirers he had momentarily escaped.

The gallery was full of them. Most of them were merely curious, but some were genuine collectors, and among the throng was an occasional face that Adrian recognized: one of the crucial few whose impressions really mattered.

It was Adrian's first one man show: 170 carefully chosen paintings, the work of over four years of unrelenting, backbreaking toil.

A figure caught his eye. She was old, bent, not particularly well dressed and clearly not complimentary to the occasion. Perhaps that was her intent—to appear in the guise of a bag-woman, and sneak an undetected glimpse. If that was her plan, it failed. Adrian knew at once who she was, and with recognition came a palpitation, a dryness of the throat, tension in every muscle. She was the *one*: she was Daphne Blanchette. Of all the critics, she was the most respected and the most feared. Her opinion counted more than all the others put together. For over thirty years she had selected all the artists whose works really mattered for every important museum in the world, including the Louvre.

Adrian watched her, breathlessly, as she waddled from painting to painting. She seemed so casual, her face rigid and wooden, as she swept by each one with hardly more than a glance. But Adrian knew that in that fleeting glimpse she carefully noted and catalogued everything from choice of subject matter, to color, to lighting and shading, to technical skill in application of the preservative coating.

One by one she checked them all, then turned and walked toward him. For an instant Adrian thought she might speak. She surely recognized him, since his picture appeared on the front of the brochure she held in one pudgy hand.

She did not speak, but simply paused a moment and looked at him, gazing unblinkingly for brief seconds before the barest hint of a smile appeared on her lips. Then, as rapidly as it had appeared it vanished. She turned and waddled out of the gallery.

My eyes! She looked into my eyes! Does she know? Adrian's left hand passed slowly up the back of his neck, fingers ruffling the thick hair of the nape, feeling for the tiny ridge of flesh that covered the implant buried there. From this site they carefully crept to the frame of the "glasses," themselves a work of art.

Adrian's "eyes" were mere ornaments, useless, left in his head only to

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preserve the appearance of normalcy. His real sense of sight derived from the receptors etched into the lenses of the glasses, whose tiny signals traveled through monomode fibers in their frames to contacts over the implant. And buried, deep inside his visual cortex, lay the biochip that enabled him to see; that bridged the gap between the organic and the inorganic. Adrian had been blind since acute glaucoma had destroyed his sight, seven years before.

Did *she* know? Adrian couldn't tell. Would it matter? He thought not. Daphne looked at art as art. She had to, to remain a credible critic. Had he created art? Had he passed her test? Again, only time would tell, and he must wait until some reliable clue appeared. It was the waiting that Adrian hated most.

10:00 A.M. Monday, November 10, 2031—Paddock Club—San Diego.

Todd Hunter stepped out of his limosine onto the thick pile of the runner which covered the asphalt drive, and walked under the canopy to the door. It was a steamy day, and even beneath the shade he could feel the heat seeping in. No matter. It was mere steps from air-conditioned car to air-conditioned clubroom. For that distance, he could stand it. The small discomfort would not have been worth compromising his appearance. It would never do for the public to see him in anything but band-box shape.

He knew he cut a dashing figure in a three piece suit; that his noble profile looked more pleasing unblemished by beads of sweat, and his carefully groomed beard more macho when every single hair was in place.

As he walked those few steps he felt a compulsion to feel the back of his neck and touch the implant. He resisted it. Far too many people already suspected one was there. Fortunately, few knew for sure. His influence and his money assured that.

The implant was a godsend. Without it he would have been obliged to go on in the old way, and in the old way lay perils. Sooner or later he would have been discovered; perhaps prosecuted, certainly blackmailed. In any case there would have been an eventual scandal. But the implant made it safe for him to indulge without fear and in perfect safety in what to the rest of the world was a gross perversion.

Inside, he made a few casual remarks to the doorman, paused to sneak a look at the bulletin board for messages, and carefully avoided looking in the direction of old Curruthers, the club's senile senior member, who noted the comings, goings and activities of other members as his main mission in life. He hastily retreated down the corridor to the "game rooms."

The game rooms were private, their contents secret. Admission was by key-card only. Todd inserted his in the slot with fingers shaking in anticipation of delights to come.

Inside stood Emile, the attendant, looking bland, poised, wise and slightly contemptuous. The club tradition was servility of the help to the members but there was nothing of the lackey in Emile. Eventually, Todd planned to speak to the board about replacing him, but for the meantime, reliable, competent

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operators were too scarce for him to rock the boat.

As a technician, Emile was superb, but as a person he was more sanctimonious than Hunter cared to tolerate. Emile knew well why members came here, though of course he could not begin to guess what went on inside their heads. *But*, thought Todd, *his speculations are impertinent enough.*

"Good morning, Mr. Hunter. How long will you be today?"

"An hour, I think; yes, make it an hour. I must be back at the studio at two, and then, in the meantime, there's lunch, you know."

"Of course. Here; let me help you up."

Hunter mounted the padded table and adjusted the straps that would keep him from falling off, should he move while he was under. Actually, there was little danger of that, as the activity of the person affected was almost totally cerebral, but the manufacturers of the machines were scared of products liability claims.

Once strapped in, Hunter allowed Emile to attach the fine electrodes to his circuit-strip. By this time anticipation had him fairly drooling. He knew well what came next since it was his favorite fantasy; the tape would thread into the player, and when it began to roll his conscious mind would bow to the command of his id. And Hunter's id was as wild and unbridled as ids ever got.

The tape, of course, was Hunter's own exclusive creation, compiled over many sessions, each one a refinement of the last. To anyone else it would be completely incomprehensible, coded as it was by and to his own neuronic parameters, his own unique masterpiece of fantasy. Some day, he knew, this would change, and someone would develop a program to make one person's fantasies readable to others. Rumors of such a breakthrough were already going around. This was why, beginning today, Hunter would take the tape with him when he left and keep it under lock and key.

Hunter watched Emile adjust the player, punching in long numerical codes and twisting dials to match the impedence of his own neurological system as precisely as possible. This was where Emile's true value lay.

It was one thing to play back a tape and know what was on it, and quite another to do it with the sensations enhanced by the biochips linked to his own cortex. With proper adjustment, these could be ecstatic in the extreme.

Emile threw the final switch. A ten second countdown began, each elapsing interval announced by a sharp "beep."

It began: Hunter found himself in a shaded glade. It was early morning, and the forest around him was overhung with mist that drifted down among the trees. Between the trees shafts of sunlight stood like pillars set in the forest floor, reaching up to the heavens. Across the landscape there floated sweet scents, and a zephyr brought the occasional sounds of chirping birds. Hunter drank it in, savoring it, knowing it was essential to the mood but gripped with anticipation of what was yet to come.

He was himself at present disembodied, surveying the scene from some vantage point even he could not recognize. It always started like that, but it was soon to change.

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Somehow, by another mechanism he did not understand, but which his fertile imagination had contrived and of which he deeply approved, his attention zoomed in on a small figure dressed in white, who entered into one of the shafts of light.

The figure grew, or he himself came closer; Hunter neither knew which, nor cared. It was enough that he could now see in more detail, and more important "feel" that he was near her.

She walked slowly, cornsilk hair knotted in braids; ice-blue eyes gazing innocently ahead. Her tiny feet were shod in white leather slippers over white knee-high socks, and she carried a bouquet of blue cornflowers.

Hunter watched, fantasy heart beating as rapidly as it might have done in real life. At the start of the tapes, Hunter always knew that what he saw and felt was fantasy, but as things progressed that realization became dimmer and dimmer, until at last the sensation of reality became complete and he forgot its origins until he woke again.

This process was beginning now, and suddenly, everything came at him from a new perspective. He could still not see himself, or rather, all of himself, but he was no longer disembodied. Bodily sensation returned. Conscious control of his motor nerves resumed. He could see those parts of his body which he would normally see in reality: the sides of his nose, his arms and legs, his upper chest and trunk. He was nude.

Hunter looked down at his feet as if he wished to be certain that should he want to run to her the feet could carry him. Yes, there they were, bare, toes spread across the verdant pile that floored the pavilion, resolute and waiting. Behind him, he knew without looking, was an immense four-poster, complete with canopy, hung with red roses and draped with white satin bedclothes, turned down and ready. He stood beneath the folds of gossamer cloth that composed the pavilion's sides.

The girl approached, steadily. She had seen him by now. Her face reflected not only recognition, but adulation. Her innocence was gone. The smile of the temptress was erupting across a face grown suddenly wise.

Hunter had never named the girl, nor had he sought to learn the name of she who was the model for his fantasy. It was not names that mattered, but ideals of form and the irresistible flavor of forbidden fruit. She had simply emerged from the crowds of faceless children seen somewhere in his past. Perhaps she was even a composite of several. Again, he neither knew nor cared. He was concerned only that she *seemed* to be here, and she *seemed* to be real; real enough so that when the fantasy had ended, and he had taken her, he would enjoy the same satisfaction as he would if they had both been flesh and blood instead of dreamstuff.

The fever mounted. She was but a step or two away, and moving up the sharp ramp onto the carpet. Her arms rose, extending the bouquet, eyes fixed on his, her smile broadening, exposing white, even teeth.

Hunter saw his arm reach out; watched his own hand extend and grasp the bouquet, even as she took another careful step. The perspective changed. He turned, and placed the bouquet at the

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foot of the bed, where the sheets depressed under its weight.

Then, suddenly, he had her, lifting her into the air, drawing her close. He felt the swaying motion of the dream body as it carried her forward.

Hunter's passions mounted, and in the wave of emotion that rose the last vestiges of the synthesis vanished. Here, at last, was complete reality. What he would now experience would be to him not fantasy, but fact. Therein lay the value of the implant. It enabled Hunter, and other rich men like him the luxury of unbridled, unsuspected passion, their perversions hidden away safely inside their own heads.

In a fleeting and unheralded instant the situation changed. There was a click. Instantly, one reel of tape ceased its rotation; simultaneously, another began. Emile lifted the first from its spindle, and slipped it carefully into a case beneath his console, among the others he had been collecting. He had watched Hunter's facial expressions as Hunter, the sensory data now loaded into his temporal cortex, lived his dream; watched as these reflected the rising of Hunter's bizarre appetite to an absolute pinnacle.

Effectively alone, Emile could now safely mutter the words of comtempt he dared not allow his wakeful subject to hear, or even suspect had ever passed his lips. He did not share Hunter's appetites. He had one of his own, which Hunter and others like him would henceforth help him satisfy. Emile's god was money.

1:00 P.M.—Monday, January 5, 2032—Studio B Marathon International—Burbank.

* * *

Never before on any human face had Doyle seen an expression to match the one on the boss's ugly puss. Never before had he ever seen Horace Young speechless.

He had watched the man "return" from his first brush with the world of make-believe—return with his eyes glazed, his lips forming unuttered words and his body coiled and tense as a watch-spring.

To preserve the integrity of the physical hookup the attendant rushed forward to disconnect Young from the recorder, and it was only after this was done and Young was sitting up that he could focus his thinking enough to talk.

"Absolutely incredible," he said, over and over again.

"Now you see what we're up against, Boss. There's no way Hollywood can compete with stuff like that."

". . . ible. There I was, a hundred fifty years in the past, standing in the middle of a dirt street. It was all so real."

"But that's just it, Boss; it's not real. anything, and I mean *anything* goes. That's the attraction."

"I threw down on John Wesley Hardin, beat him, shot him down and watched him die. I can still see his blood soaking into the dust."

"Boss, get hold of yourself. It wasn't real: even the experiences weren't yours. It was a tape, a tape of somebody else's fantasy."

Young's expression changed. He became rapidly sober, as the flint-hard mind that had made him "The Boss" of the world's most successful, and one of its largest motion picture studios

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came to grips with reality. "I'm OK now, Doyle. But, God! what a thrill: El Paso as it was in the 1870's; that old .44 jumping into my hand; the gunfire and the bullets whistling past my ears . . . he barely missed me, you know."

"I know. It happens to everybody. Now, I think you'll agree that if we want to hang on to our share of the entertainment dollar we have to offer the public something more than 3-D feelies. If we don't the next quarter's earnings report is going to make this quarter's look good."

"You bet I do; what's more, we have to get the jump on the other studios. I'm sure they'll be looking into this too."

"There are the usual rumors, Boss. So far as I can tell, though, they're just putting out feelers, like we are. And the real competition might not come from that direction. After all, this is not a traditional visual system."

Young hopped down off the table, then stood, leaning against it and gingerly fingering the small bulge at the base of his skull. His implant was new, scarcely two days old, and it was still a little tender. He had decided to submit to the process at Doyle's urging, even though it had meant going outside traditional medical ethics to get the job done. For the first day he'd been seriously worried about infections, but then the swelling had gone down rapidly and the wound was now almost fully closed.

"Hmm. Well, scout around, Doyle. Find out who that competition's likely to be and start buying."

"Buying? Buying what?"

"Whatever's necessary. Whatever's for sale."

"Right, Boss, but it's not going to be that easy. There are no recognizable leaders yet. Most of what there is is stuff that individual operators filched from customers before there were any programs developed to play it back. Before the programs, each fantasy was an individual thing. We don't even have any idea how many of these tapes there are."

"But you know how many we have."

"Sure. We've got about fifty of them, including the one you just had."

"Then, lets get as many more as we can, as fast as we can, and tie up the producers with exclusive contracts. That way, at least, we can hold off the other studios."

"What do we do about a distribution system? This is not exactly mass media entertainment, you know."

"It isn't now, but I can see possibilities. The secret to success in this business, or in any other business, is to get as big as possible as fast as possible. Size means money, and the more money you have, the easier you can stomp the competition. There again, we'll need to do some digging around. That'll be your job, Doyle." Young left the table and went to the doorway. He lifted the broad-brimmed hat off the costumer and placed it on his head, squaring it so that it shaded his eyes, as had the one he wore in his dream-duel. "Keep me advised," he said, as he walked out the door.

Doyle knew that keeping the Boss "advised" meant reporting to him by at least 8:00 the next morning. He was waiting in Young's office when Young arrived for the day.

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Coffee flowed. So did words. Doyle gained much merit.

"We're in luck, Boss. I was wrong. There does seem to be one guy out there with an imagination. He's already acquired many of the really interesting tapes on his own initiative. He's a former operator, but, he's a greedy one. His name is Emile Chounaird."

"So am I greedy, Doyle. If you think he might be our man, find out what his price is and buy him."

"Like I said, Boss, he's got stars in his eyes. He says he's after a piece of the action."

"Then promise him one. I've handled his kind before, Doyle. We'll take care of him, too, when the time comes. Now, what about distribution?"

"Chounaird had some ideas about that, too, Boss, and to me they don't sound half bad. If we can keep him under control he may well be a diamond in the rough. He's obviously put a lot of time into planning. He thinks we should set up a gamenet."

"Then he's crazy. The public would steal us blind. Entertainment nets never have worked. Look what happened to AT&T when they tried it."

"That's the first thing I said to Chounaird, but he insists his concept is different."

"How is it different? Once you run a tape people record it, and pretty soon you've got bootleg copies all over the place, even if you protect it with codes. A few sharp hackers and enough time and you're all washed up."

"Uh-uh boss. I've listened to Chounaird's arguments and they make sense. First of all the other gamenets that were tried didn't require any special hookups; this one will, and we'll be appealing to a special segment of the population which is not only—well, perverted, but basically lazy. Second, the tapes are only a matrix—sort of a framework, and the bulk of the fantasy has to come out of the user's own subconscious anyhow. Third, there are ways to put in deterrents, and Chounaird claims he has some really nasty ones. For instance, there's one he says came from a mafia torture expert that's so real it puts welts on you. Imagine having something like that pop into your bootleg fantasy—a fantasy you can't test play in advance. The users will have to trust us to provide safe stuff. They won't dare double-cross us."

"You think the risk is acceptable, do you, Doyle?"

"Good enough to take a long look at it, Boss. Of course, there isn't anything to stop other people from setting up competing networks, but . . ."

". . . But competition doesn't scare me, Doyle. Take that good long look."

"Consider it done, Boss."

11:30 P.M.—Saturday, November 13, 2032—Provident Hospital, Brooklyn.

It was the waiting that Stas hated the most. He sat on the uncomfortable waiting room bench picking at old, tattered magazines, while the odors of strange medicines drifted through the drafty corridor and up his nose. Across the room sat a drunk, waiting for his "girlfriend" who had fallen on the ice to be patched up and released, so she could go back out, and drink some more, and fall again.

The night was not fit for that, or fit

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for anything else for that matter. The weather control over the northeastern U.S. had failed, and there had been snow, followed by icy winds that drove it into every crack. Not a very good time to be a beat cop, thought Stas.

Was there ever a good *time* for that? He wondered what on earth possessed him to make that his vocation, and told himself there must have been a thousand other things which suited him better. Briefly, as a youth, he had considered the priesthood, but later years had proved to him that he didn't have the faith that this required. These days he found himself with less and less faith in anything. The world had changed on Stas, and Stas didn't like it.

"Sergeant!"

Stas looked up. He had not heard the man approach. The reason was apparent at once. Dressed in surgical greens, he had obviously just come from an operating room, where, to eliminate the risk of sparks he wore the gum shoes that made his footfalls silent.

The man was short, small boned, with a face of indeterminate Asian ancestry. The face looked tired, but otherwise unemotional. "I'm Dr. Sing. I'm sorry; we lost him. We—"

"Yeh—I know—you did the best you could." Stas tried to keep sarcasm out of his voice, but it crept in anyway. "Do they know . . . downtown?"

"I wanted to tell you first. I thought maybe—"

His words trailed off. Stas knew why. Most medical people in this neighborhood were pretty streetwise. They knew the score, and the score was that Sgt. Stanislaus Sosnoski was going to get some time off while internal affairs "investigated" the fatal shooting of a "burglar" in the line of duty.

"Yeh; thanks, Doc. I'll call it in myself."

"There *was* one more thing you ought to know, Sergeant; he had an implant. We didn't find any prosthetics to go with it but . . ."

"Oh? Oh, no!"

Sing nodded, mumbled something else that Stas didn't hear and ambled off.

A few minutes later Stas was at the phone in the nurses' lounge talking to Captain Gino Caesario. He'd made his brief report, dropped his bomb, and was now enduring the punishment his tardiness had earned him.

"What is the matter with you, Sosnoski? You shoot a kid an hour and a half ago and you're just now calling in? You know what the newspeople are gonna say about that?"

"I know, Capt—"

". . . Cover-up: I can see it now on the morning news—Killer Cop Shoots Unarmed Kid."

"But that's not the way it was, Captain; he had—"

". . . An object in his hand which in the darkness appeared to you to be a weapon, and you reasonably believed he was about to resist arrest and you drew your own weapon, following standard police procedure."

"But it did look like that. I—"

". . . You shot a kid who was trying to shine a flashlight on you, a flashlight that didn't even work."

Stas did not answer.

Caesario went on with it. "Look, I know how it was. I've been there. The rest of the force knows how it was. They

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been there. But the public hasn't been there, and what's more, they don't care how it looked to you. The public don't care about nothing."

Again, Stas didn't reply.

"What was he doing in there, Sosnoski? Did he take anything?"

"He had some loot piled up by the elevator. I got there before he had a chance to get anything out. The alarm went off, and the call showed up on my monitor as a possible; possible—I wish they'd clear up the orders on that kind of stuff. If I'd known for sure I'd have called in a back-up, then there'd have been witnesses around."

"Go on; what did you do next?"

"Used the Department by-pass chip to get the door open and turn the alarm off; looked around, heard a noise. I figured there was an intruder inside for sure then."

"And you still didn't think to call in?"

"No—no, I didn't. I couldn't move. I was in the lighted area. I was a perfect target. I wanted some cover before I made any noise, in case he heard me."

"So you got in the shadows, and you saw something . . ."

"And I called out 'Police, come out with your hands up.'' And then I saw this arm come out with a thing in it that looked like a gun."

"So you fired?"

"Yes."

"To kill?"

"I considered it a life or death decision."

"And it was a kid—a fifteen year old—"

"Sixteen—he was sixteen."

". . . kid, with a flashlight."

"I didn't know that!"

"You know I have to suspend you?"

"I expected it."

"Then get down here right away."

"Captain, before I leave, there's something else I think you ought to know. You're gonna have to be ready for this."

"What's that?"

"The kid had an implant."

"What?"

Stas cringed. He'd had a feeling it'd be like that. It made things worse. Maybe he'd killed a kid who couldn't hear him, or see him, or who didn't have the smarts to know what Stas wanted. Medicine had done some incredible things with implants, but there were also failures; failures that now walked the streets looking like anybody else.

9:46 A.M. Tuesday, December 20, 2033—1401 K Street, N.W.—Washington.

Glen Moulton, briefcase in hand, emerged from his private office and walked the few steps down the corridor to the secretarial area. Before he even reached it he could tell there was something wrong: a voice he knew but didn't yet quite recognize was pleading with his secretary to let him past.

Glen cautiously slowed his pace and peeked around the corner, where a red-haired, freckle-faced man stood bending over Alice's desk with his back to Glen.

With a face to go with the voice Glen realized this was no ordinary situation. "Curt—what are you doing here?"

Curtis Morton turned, his face covered with a look of desperation. His right hand rose, shaking a sheaf of pa-

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pers. "Look what the Sheriff just brought me."

Glen recognized the format: these were suit papers. He recognized the reaction too, which was common enough, and he'd seen it hundreds of times before. Something about a summons excited instant panic in anybody who got one, even if the recipient was a lawyer. Once the panic passed the next step was rage, and that was inevitably followed by a vicious and all-consuming quest for retribution.

"I'm on my way to court, Curt. I just don't have time to—"

". . . I'll walk along with you. We can talk on the way."

Glen knew there was no way out of it, though he resented the intrusion. His walk to the courthouse was normally reserved time, useful in getting his mind in shape for what he would do when he got there. It was a time when he could not be bothered by the telephone and when the smooth, steady pace of the walk promoted orderly thinking. For this morning there would be none of that. He looked at Curt, who was holding the papers out to him. "OK," he said. "Let's go."

He handed Curt his case and took the papers, unfolding them as he walked out the door. The caption surprised him, and so did the name of the plaintiff, Marilyn Morton. It was a suit for divorce.

Glen knew Marilyn, though not well, and she'd seemed to him to be a nice person. And he had believed, up until now, that the marriage was a happy one. His acquaintance with Curt went back a lot further, of course, to when they were both in law school. This had been a time when they were fairly close, but after graduation Curt had joined the F.B.I. as an agent, while Glen had gone into practice with a couple of his other classmates. Now, Curt was Assistant Director of the Bureau, with every expectation of moving up to the top job someday. But a thing like this, even in an enlightened age, could hurt his chances badly.

He scanned through the rest of the complaint, noted that it simply recited the usual garbage, refolded it, and handed it back to Curt, who took it.

Curt's face broke out of the pensive look in which it had been locked and he said, "well?"

"Well, what? Curt. She says she wants a divorce. This is a no-fault jurisdiction. There's no such thing as a defense, and there's nothing you can do to stop her. My advice is shut up and let her have what she wants. If you make a stink it'll get into the news for sure."

"B-but, she's irresponsible. That's not Marilyn talking; that's—that's—"

"She signed it, Curt. Look, do you think I like telling you this? I don't, but marriage is a pretty voluntary thing these days. Either they like you or they don't and if they don't the knot gets cut, and—"

"Glen, I realize I'm out of touch with the civil side of law; that's why I came to you, but I seem to remember a litigant has to be competent to maintain an action, and I tell you, Marilyn's not herself." At the end, Curt's voice was plaintive.

This was another reaction to which Glen was no stranger. It was always advanced as an explanation whenever wish overcame reason. He slackened his pace, knowing that he'd have to hear

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Curt out, even though it wouldn't alter either his opinion or the outcome of Curt's case. "Look, Curt, I'm sympathetic, all right? But you're talking like a layman. Filing a suit for divorce isn't evidence of incompetency."

"Glen, I know that; that's not what I'm talking about. Marilyn's being influenced—"

Glen's ears ignored the rest; the tirade about the in-laws was about to start. Even from a friend he couldn't stand to hear that another time.

". . . got that implant, and then she got hooked up with these people who're into the fantasy net, and—"

It was like a switch had tripped in Glen's awareness. Suddenly, the sound was back on.

". . . since then she's been a different person."

Glen stopped; faced Curt. "What did you say?"

"I said, 'Marilyn's playing on the dream machines.' Nothing's real to her anymore."

"But those things are for kooks."

"That's what I've been trying to tell you, Glen. She's not Marilyn anymore; she's somebody else. I don't know her anymore."

"I see." Glen's brain began boiling with speculation. Hints of similar things had been turning up in other areas of his practice lately, though they mostly had to do with the criminal end. He'd hardly expected to learn that it had penetrated into professional families. "Did I hear you say she had an implant? Why?"

"She's diabetic. They put it in two years ago to control insulin dosage, and they plug her into an analyzer once a month to monitor it. But now she's using it to have fantasies. She's started running with a crowd that does nothing else."

"And you claim this is affecting her sanity?"

"You bet it is." Curt was moving into stage two now. His anger mounted. "At first she had this 'pacified' look. She was listless, lethargic. Nothing seemed to upset her. But that didn't last. Pretty soon she started getting belligerent: everything I said or did provoked an argument. Our sex life ended completely; she said I was nothing compared to what she had on the net.

"She started neglecting the housework; her own appearance. I hired a maid, but the maid quit after the first day. She said Marilyn was a zombie, and she wouldn't work for a zombie. I put my foot down, and told her to straighten up, and I demanded she get the implant removed. She packed up and left instead. That was five days ago."

Glen glanced down at his watch, noted that time was getting short, and resumed walking. The courthouse was still a block and a half away. Curt followed along, waiting for Glen's next response.

It came. "There is one thing you might want to do, Curt, something that'll put you into a position to challenge her right to relief."

"What?"

"In this jurisdiction you can petition the court for leave to have the other party submit to physical or psychiatric examination. It's part of the counseling section of the statute, and the reason it's there is to get people interested in talking to professionals who might assist in getting a reconciliation going."

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"Let's do it."

"She'll ask the court to make it reciprocal. Can your own ego stand that?"

"I'll do anything I can to get help for her, Glen. I don't like what she's become. I want my old wife back."

"All right, Curt; look, let me get my courtwork out of the way, then meet me at the office, OK? We'll get it started."

Curt left, and Glen completed his trek to the courthouse alone. By this time, however, his mind was not on the matters pending, but on a different track entirely: the legal implications of the dream machines.

3:00 P.M.—Thursday, February 5, 2033—Rosemont Garden Apartments, Queens.

Father Heriberto Perez was a wiry little man, pushing forty-five, but lithe and athletic enough not to show it. He wore his clerical garb under a plastic raincoat, and a light rain was in fact falling. It made the streets wet and slippery, and once or twice on the way over to this strange neighborhood he had feared the bus driver had seriously misjudged the traction he could get on them.

He had survived, and at this moment found himself ascending the steps of a nondescript apartment building in a nondescript residential neighborhood to meet a stranger who no doubt would be equally nondescript.

Father Perez was not native to the city. He did not like the city, or what the city did to people he did like. And he knew that he did not truly understand either this massive slag of concrete and asphalt or the individuals who burrowed in it. There were times he did not understand himself, and he had stopped trying to explain to others why the superbly educated only son of a wealthy Puerto Rican family would lay it all aside for an archaic collar, a black suit, and a share of other people's troubles.

A few brisk steps brought him to the double transparent doors and he paused, realizing that despite their fragile look they were probably not glass but some exotic plastic capable of turning a bullet.

A voice boomed out—not a human voice, but a computer synthesization: "Good afternoon, sir. Please state the name of the party you wish to visit and present your identification to the monitor."

Heriberto fished in his pocket for his driver's licence and for the slip of paper containing the officer's name. "I wish to see Sgt. Stanislaus Sosnoski."

"Identification is accepted. I am ringing the party's telephone to determine if he is accessible. Please wait."

Heriberto waited in silence, knowing that although he could not hear, the monitor was announcing his visit.

The silence was broken; the doors popped open. "Please enter, and follow the pulsing green line to the elevator."

Heriberto did. He knew that the pulse was more than a guide; it was designed to keep track of him, to see that, once inside the building he did not stray. Sosnoski, being what he was, and knowing what he did, could have been expected to choose such a place.

A few minutes later he was comfortably seated on a couch in the policeman's small living room, while his host fidgeted, fretting no doubt that he had not completely covered up the evidence

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of the afternoon's diversion. His eyes seemed never to leave the half-empty glass of whiskey that rested on the end table beside the priest's elbow.

"Uh—what can I do for you, Father?"

Heriberto cleared his throat. "My mission concerns David Villanueva."

"Uh—yes." Stas's eyes lingered on the glass, a hungry look visibly detectable in them. "Yeh—that was a shame. I really am sorry about it. I keep thinking maybe if I'd only waited a second or two longer—"

"I am not here to excoriate you, Sergeant, or to place blame, nor to offer excuse, either for you or him."

Stas looked up, puzzled. "No. Why did you come?"

"Because you are a man who knows the streets, Sergeant Sosnoski. And you know that what happened to the two of you has happened many times before; that it will happen many times again, and that it was only an accident of chance that it was you and he."

"I know that. But knowing doesn't make me feel any better, especially when the kid was handicapped."

"Oh. You mean no one has told you?"

"Told me what?"

"That he wasn't handicapped; the implant David had was not there for reasons of health."

"But, why else would he have it?"

"That, Sergeant, is why I have come. David's implant was illegal; what those in your calling would call a bootleg job. Surely you have heard of these?"

"Yeh sure; there's been a few turning up. Look, Father, it's my day off, and, well, I've been having a few drinks—uh, would you like one?"

"Yes, Sergeant, I believe I would."

Stas got up and went to the kitchen for another glass. He returned and poured a couple of fingers into it, then handed it to the priest. Afterward he fortified his own drink, filling the glass to the brim.

Amused, but gratified that his own indulgence had humanized him and put his host at ease, Heriberto went on. "Tell me, Sergeant; what do you know of these dream machines?"

"They're around. I know a couple of cops who tried them. They're *not* cops *anymore*. The machines are supposed to drive a guy buggy; that's what the department says." He took a long pull on his whiskey and stared up at the priest. "So?"

"So, do you believe that?"

"Yeh; I guess so. Anyway, we've been pulling in a lot of people who're wired for 'em. I guess you could say crooks are nutty."

"Sergeant, the biggest problem in my parish used to be dope. It's presence pervaded everything, touched every household and every young life. It was the currency out on the streets. To be a rich, successful dealer was the ambition of half the young boys in the neighborhood. You know the story as well as I do: how the dope trade generated all kinds of other crime, and how it created a society where the most wondrous thing was that in spite of it all *some* of the people managed to resist the temptations it offered."

"Yeh—like you say, I know the story. What's it got to do with the dream machines?"

Heriberto put his glass down on the end table, and leaned forward, as if what

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he was about to say was a confidence. "Sergeant, as bad as things already are it appears to me that they are going to get much worse. If dope was the tool of the devil I think the dream machines may be his ultimate weapon. It is starting to happen all over again; David was only one of them, and he was one of the first."

"What're you talking about? *What's* happening?"

"You have not observed differences?"

"Father—I'm just a street cop. I catch 'em breakin' the law on my beat, I bust 'em. I don't stop and ask 'em why they did it. It ain't my job to ask. And I don't care why."

"You *should*. It's important. I can tell you this, Sergeant; very soon statistics will begin to call attention to the fact that more and more people are turning to crime because of the machines than ever did from dope. More and more kids like David will be coming out of the slum neighborhoods into 'your beat.' "

"Yeh? Well, if they do, then they do. It still ain't my job. Look, you said you came to talk about the kid. Well, we talked about the kid, and we agreed he's dead, and we agreed I killed him. What else is there to say about the kid?"

"That he started out to be one of those promising boys who resisted temptation; that he couldn't resist the dreams; that his death is a signal to us that we have to do something. Look, Sergeant, David was attempting to commit a burglary when you tried to arrest him, wasn't he?"

"It's all in my report, Father. They printed my report in the papers. He had the loot piled up at the elevator. Yeh, he was stealing."

"Do you know why?"

"You're gonna tell me he was supporting his dream habit?"

"Exactly. I talked to some of David's friends. They said that after he got the implant all he could think about was how to get more dream time. He lost himself in some fantasy about being a professional football player."

"Him! The kid was a shrimp. He couldna' weighed 110 soaking wet."

"Not in his dream, he wasn't. This is what is so insidious about these dream machines; they rob the mind of reality, but unlike dope there is no corresponding physical dependency to alert the victim to the danger. They seem harmless, so the victim goes on and on, sinking deeper into the pit. He will accept no aid and no criticism. He could get out of it if he wanted to but he cannot want to."

"Neither can the dopers."

"True, but at least some of them do make it when they are deprived of drugs for a sufficient length of time. They suffer physical withdrawal and they can see what has happened to them. The dreamers can't do this. Deprived of access to the machines they retreat into themselves, into hebephrenia in extreme cases."

"I don't know what that word means."

"They crawl inside themselves, Sergeant. Their minds leave this world and hide inside their own imaginations. They break all contact with reality, and with everything outside themselves. They crawl back into the womb."

"Oh. Sort of like a guy who gets drunk, huh? Stas chuckled."

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"Much worse than that, Sergeant."

"Well, how's a kid like David get hooked in the first place. Where does a slum kid get one of those implants?"

"Everything is available out on the street, Sergeant. All it takes is a demand, and for a price someone will supply everything. For the girls the price is generally prostitution; for the boys, street crime. And the proceeds go to those shady medical clinics that have sprung up everywhere. I'm told that the implant operation is not especially difficult, or even very dangerous anymore, provided the proper antiseptic measures are taken. It is even becoming relatively cheap. They use an instrument which does it all through a simple one-step puncture. Nothing else is needed except a local anesthetic and a fluoroscope.

"This is why a slum kid could get one. Perhaps those who operate the dream machines first supply the implants, and then collect for them later, when a dependency has been built up. It seems a natural assumption."

"Why are you telling *me* all this? Is it supposed to make me feel better?"

"No. I am telling you because I want you to become irate over the fact that it *is* happening. I want you to think about *why* it is happening. I want you to tell others *that* it is happening, and what it is doing to people; that people are out on the street committing crimes and getting themselves killed so they can indulge in what amounts to mental masturbation. That is why I am telling you."

"B-but I'm just a street cop. Th' big shots—"

". . . May very well be in on it, Sergeant. Sergeant, listen to me; you think dope was big? This is bigger. You think the drug traffic generated corruption? Wait until you see what this can do. It was *illegal* to sell or possess drugs; it is not illegal to possess a dream machine, or to tape fantasies, or to indulge in fantasies. The stock of companies that engage in this business is traded regularly on the major exchanges.

"Not only that, but it has been the upper levels of this society who were the first to explore the phenomenon, because they had the money and the influence to get access to the machines. This is starting out exactly as the cocaine trade did. No one seems to realize or to care what a terrible danger this is.

"This is why I have come to you. The opposition to this evil must be organized at the grass roots, and that opposition must be composed of people who understand this is a moral and economic problem and not a criminal or social one. This was the tragedy of the struggle against the drug trade. People either failed or refused to acknowledge the nature of its driving force."

Stas took another drink, looked up, blinked red eyes, and turned his gaze downward again.

"Sergeant, are you listening to me?"

"Yeh, sure."

"What did I just say?"

"You said it was a moral problem."

"And, are you a moral man?"

"Me? Well, yeh, I guess so. Yeh, I am. I'm as moral as anybody else."

"And do you know why society has morals, Sergeant?"

"What kind of a question is that? Of course I know. To keep people from killing each other."

"Wrong, Sergeant. That is why men

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make *laws*. But God makes morals, and he does so to keep individuals from harming themselves. Morals are nothing more than devices to ensure that individuals do those things, and only those things, which are beneficial to their own selfish best interests. And the difficulty of application arises because in the long term the benefits are not always easy to recognize. For example, the dream machines: they give the dreamer what he wants, when he wants it, without effort, and on a scale for which reality might impose a lifetime of toil to achieve, if ever. They *seem* to fulfill the promises they make. The dreamer is cheated, but he does not know this, and that is why they are immoral."

"*Uh—yeh.*"

"A moral man will recognize this, avoid being deceived. Sergeant, *we*, you and I, must organize the moral men of this society. We must not allow any more boys like David to be sacrificed to the greed of the immoral. Are you with me?"

Stas drained his glass, and poured himself another. His look told Heriberto he was converted. His spirit, if not his voice, was with the righteous.

8:30 A.M. Thursday, May 11, 2034 —1401 K St. N.W.—Washington.

"Sit down, Curt."

Curtis Morton slid uneasily into the chair in front of Glen's desk and glanced across at his friend. He didn't like the looks of things, especially the manilla envelope in Glen's hand.

"I've got the opinion from the Appellate Court, Glen. They turned you down. You can read it if you like."

"N-no. That's OK, Glen, I'd rather not. I never had much hope for the appeal anyway."

Glen resisted the urge to say "I told you so," but he had told Curt so. The fact that the Court had bothered to write an opinion at all instead of simply issuing a memorandum decision was simply an effort to rule on the competency question for the benefit of lower courts with criminal cases pending before them, and in which the defendants had raised identical issues. There had been quite a few of these, but from his own perusal of the opinion Glen concluded that the courts weren't going to fall for it this time.

"I'm not through yet, Glen. Don't get the idea I'm quitting."

"Give it up, Curt. What's the point, now. You did what you could. You can't help Marilyn now. She'll never come out of it."

"I'm not thinking just of Marilyn, Glen. What about all those other people? Are we going to let the vultures feast on brains forever? Or are we going to stop them?"

"Regulative legislation has to come, Curt. The nets will eventually be controlled; all this wild stuff is going to go. And that's the right way to handle it, Curt. No more sadism, no more sex, no more grandiose extravaganzas just anybody can plug into. The same sort of thing that happened with motion pictures and TV will happen to these fantasy tapes."

"I don't believe it, Glen; not any more. You know what I just heard on the way over here? They've got a home unit about to come out They're advertising it on the radio. Think of it; your

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wildest fantasy is now affordable, in the privacy of your own home. And what do you want to bet the courts'll say it's constitutionally protected?''

''I'd book it, Curt. But the point is—''

''. . . The point is that regulation isn't going to help one bit. The stuff will still be there, and it'll wreck just as many lives as ever.''

''I don't know, Curt. I've seen quite a few of these fads come down the pike. They all blow over sooner or later. People get all fired up about something new and novel and everybody's got to have one. A friend of mine works at the patent office. He can tell stories all day long about this kind of stuff. We talked about this, and he claims it's nothing new; it's been that way all through history. Somebody gets an idea, it catches on, the smart money moves in and exploits it and then gets out before the crash. He says it'll happen to the dream machines.''

''And I sincerely hope he's right, Glen, but I can't risk it. I've had time to do a lot of deep thinking since we argued that appeal. I'm convinced that there's only one way to handle this; it has to be completely outlawed. The average person just hasn't got sense enough to know when to quit. I'm going to see to it that the public is protected.''

Glen's day went smoothly after Curt left. He gave little thought to his friend's vow, voiced so solemnly as he walked out the door. It wasn't that he was unsympathetic; he *was* sympathetic, but he had a natural aversion to censorship in any form. Besides, Curt's personal problems were not, in his estimation, very ordinary. Responsible, restrained use by real adults wasn't the least bit dangerous. It was Curt's bad luck that he'd chosen a weak woman.

Glen hadn't. His own wife was at least his equal in intellect and strength. She'd proven that last night. He hadn't told Curt, of course, but he *had* one of those home units, and the night before he and Lana had enjoyed a dual hookup. In the personnas of two of the Hermes XVII astronauts they'd done the grand tour of the planets, a sort of a celestial honeymoon.

It had been great, but the greatest thing about it was the novelty, and unlike Curt's foolish wife neither of them wished to spoil it by doing it too often. And unlike Curt, Glen was not about to let Lana ever go alone.

10:00 A.M.—Monday, February 26, 2035—Committee Hearing Room —Senate Committee on Communications Media—Washington.

A rude sound erupted from the microphone, a sound that Senator Foxmoore found more effective than the thump of his gavel for bringing a meeting to order. When he wanted silence he simply cleared his throat. When he had silence, he convened the hearing.

He turned to the Committee Secretary. ''Who's our next witness?''

The Secretary took the cue, stood, and called out a name, after which a solemn, but curiously juvenile-looking red haired man rose from the witness bench and stepped forward. He had with him a leather case, bulging at the sides.

When he reached the Secretary's desk he put the briefcase down on the floor

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beside him and raised his hand, preparatory to taking the oath. This alone marked him as a professional in the eyes of the dark man in clerical garb, who watched from the gallery.

The man took his seat in the witness chair and waited.

Senator Foxmoore: "Mr. Morton, I see by the agenda?"

The Witness: "Yes, Sir. Curtis Morton."

Senator Foxmoore: "And you are Assistant Director of the F.B.I."

The Witness: "Yes, Sir."

Senator Foxmoore: "Do the views you are about to express represent those of your superior, The Director?"

The Witness: "I speak for the Bureau, Senator."

Senator Foxmoore: "Very well; You may address the committee, Mr. Morton."

The Witness: "Thank you, Senator. I'll need just a moment." He reached down to the floor and lifted up the case, laying it on its side on the table in front of him. With a flip of the catch it popped open and an avalanche of papers spilled out. Around the room committee members flinched, sensing they were about to be overwhelmed with a flood of statistics. They were.

Morton's opening remarks took a half hour, and it was apparent he had made his presentation a labor of love. His words were positive, chiselled, and packed with venom, so as to leave no doubt what the official position of the bureau was. Inevitably, however, the members began to hit him with questions.

Senator Haycraft, (D) Wisconsin: "Mr. Morton, I must say that I'm personally impressed by your statistics, *if* they're accurate, that is. But, 25 million people using the nets every day? Well . . . It seems to me that's a substantial segment of our work force. Why isn't there any corresponding decrease in productivity?"

The Witness: "Those people aren't really in the work force, Senator. They never were. Mostly, they're the same bunch that always has had the leisure time for such activities: high school kids, housewives, retired people, unemployed people, and—criminals."

Senator Haycraft: "Yes, let's talk about that part of it; would you mind running over some of the crime figures again? My notes got a little behind you."

The Witness: "Not at all, Senator. Bureau figures—and these represent the latest available, show that property crime, during the last five years, has increased in direct proportion to the use of the fantasy tapes, and now stands at historical highs in every category."

Senator Haycraft: "And by property crime you mean—"

The Witness: "Shoplifting, burglary, larceny, embezzlement, forgery, vehicle theft, etc. Of course, there've also been increases in strong-arm and armed robbery, but we include those in another category."

Senator Haycraft: "And there's a connection between the two?"

The Witness: "Unquestionably. Approximately half the people arrested for crimes in this category have at least one prior arrest for a similar crime. Many have had several. Nine out of ten of these people have implants and eight out of ten are under twenty-five years of

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age. I would say there is a definite connection between the use of the fantasy tapes and this criminal activity."

Senator Foxmoore: "Excuse me, Senator Haycraft; the Chair wishes to clarify something."

Senator Haycraft: "I will yield the floor, Mr. Chairman."

Senator Foxmoore: "According to your previous testimony, Mr. Morton, there has been a decrease in certain other categories of crime. Would you expand on that?"

The Witness: "What I meant to imply, Mr. Chairman, is that the character of crime in this country has changed, not necessarily for the better, but it's changed; not decreased, changed from one type of activity to another. And, I must point out again that this is not necessarily good."

Senator Foxmoore: "This committee wants to hear all the facts, Mr. Morton."

The Witness: "Yes, sir. The facts are that except for armed robbery and muggings violent crime is down as dramatically as property crime is up. Sex crimes, for instance, are at an all time low. Rape and child molestation are down the most. Even the statistics for prostitution are showing a drop. Family violence has dropped. Alcohol related crime, and drunken driving arrests are decreasing steadily. Drug related crime is also decreasing. Even murder is down slightly."

Senator Foxmoore: "Is there any apparent connection between these trends and the use of the fantasy tapes, Mr. Morton."

The Witness: "Yes, sir."

Morton stopped there, waiting for another question. He hoped his frustration didn't show, struggled hard to keep composed. This was the one weak link in his argument, and he didn't want the natural abhorrence of violence to overshadow what was definitely a worse situation.

Senator Foxmoore: "So what you're saying is that there is a beneficial side to these tapes?"

The Witness: "Only if you look at the trends in terms of numbers, and only if you confine your examination to reported criminal activity. We have other figures that show that the monetary loss to society is far greater than simply the amount which we can tie directly to criminal activity.

"For instance, we've linked the use of fantasy tapes to student absenteeism, and found that 'trippers'—that's what these people call themselves—miss more classes than non-trippers, and drop out more often. In industry, there's greater absenteeism among them, and they also account for a greater percentage of employee theft than other workers. I believe I remember seeing something on the Committee's agenda about that."

Senator Foxmoore: "Yes, we've got somebody from the Labor Department coming over. But Mr. Morton, confining ourselves to your field for the time being, if our streets are safer, and our homes more secure, how can this committee justify recommending legislation to outlaw the use of these tapes? That's why this committee is holding these hearings: to determine what action, if any, that Congress should take."

The Witness: "I can only say that our streets and homes are not safer, Mr. Chairman. What we are seeing is an

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illusion, and this is only the beginning. The decrease in the so-called crimes of passion simply means that people who used to commit these crimes are finding more convenient release in fantasy. Fantasy offers the greater thrill, and it's a safe thrill for the tripper. He can do anything he wants without fear of punishment, but the fact remains, he usually has to steal to get the money to buy the fantasy in the first place."

Senator Foxmoore: "So what you're saying is . . ."

The Witness: ". . . is that society as a whole winds up paying for the criminal activity of the few just as it always has, but with the additional distinction that the size of 'the few' is growing alarmingly. Mr. Chairman, this is just starting. We've still got a mature population that remembers what it was like before these things came out. What happens when the majority of the public comes from a generation that doesn't and that considers the use of the fantasies normal? Well, I can tell you: we've been able to make a few projections. Twenty years from now at least half of the working public will have implants. Three quarters of these will also have tape units in their homes, or maybe, if our intelligence is correct, they'll be wearing portable units by then. Out of the population as a whole 60% will have implants. That means an awful lot of people—and it means an awful lot of money. And where is the money going to come from? And where is it going to go? That, Mr. Chairman, is the big question. The Bureau believes the crime problem we have today is going to pale by comparison to what it will be then. And we expect that as the competition for money increases so will crimes of violence. We'll see a reversal of trends in those categories which are falling now. The 'benefits' are entirely illusory."

2:30 P.M.—Wednesday, April 4, 2035—The Gallery—Committee Hearing Room—Senate Committee on Communication Media—Washington.

Father Heriberto Perez had been sitting in the same gallery seat every day the committee was in session, and it had been in session for nearly six weeks. He was getting sick of it.

He had twice tried to get on the agenda, and had twice failed, first because the committee had insisted that they had more authoritative members of the clergy scheduled as witnesses, and later, when he had made the attempt as the spokesman for the fledgling "Society of Man," he had been refused because the committee did not have time for "special interest groups."

True, the "Society" *was* just that, and it was also a comparatively small one, with most of its membership concentrated in large cities of the East and Midwest. Except for a few "soldiers" like Sgt. Sosnoski, it was made up mostly of intellectuals, and nobody —*nobody*, was listening to *them* these days.

So, he had had to suffer through the hearings listening to dozens of other people representing dozens of only slightly divergent viewpoints about what the committee should recommend; all of them, in Heriberto's opinion, wrong.

There was, for instance, Archbishop Clancy of Boston, the Vatican's own

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special expert on the fantasies, who came out strongly in favor of total abolition. Abolition was the policy of the church. It had succeeded in getting just that in some foreign countries where the church was strong. Italy was one of these, of course, and the result of abolition was exactly what Heriberto predicted it would be. A black market, tightly controlled by the underworld, sprang up immediately,

Nor did any of the other churchmen who testified seem any brighter. Where the fantasies were concerned they were all of one mind—probably for the first time in history. They all considered the participation in a sinful fantasy the equivalent of committing that act. They all condemned the fantasies; they all urged Congress to pass legislation forbidding the possession or use of fantasy machines and abolishing the fantasy networks.

Of course, the committee heard from the other side too. By this time, fantasy meant money by the ton to those interests that dealt in it. So lobby witnesses filled the hearing room just like abolition witnesses.

For a while, Heriberto thought a deal might be struck, and that legislation, if passed at all, would be lightly regulatory. He hoped it would be, and at first he believed there was merit in a suggestion made by one of the Hollywood people that voluntary self censorship should be given a try.

Of course, Heriberto knew this would be only a stopgap solution, and that in the long run it too would fail, but it did offer some encouragement. Like most every other human vice, the use of fantasies was most dangerous to individuals in their formative stages, who were impressionable and who were not yet capable of truly independent thought.

Today, as he sat listening to the committee's preliminary draft recommendation, he knew the cause was lost. The committee, without so much as an argument on the floor, had decided to recommend no legislation, but that instead Congress take the unusual step of initiating a constitutional amendment.

Senator Foxmoore explained their reasons very logically and very eloquently. The committee could envision no legislation Congress might pass that could withstand attack on other constitutional grounds, but they truly believed the fantasies constituted a clear and present danger to the nation. A constitutional amendment lacked the vulnerability of a statute, and beyond that it would fail to pass if a majority of the people didn't want it. So Congress, always mindful that what it did could result in a brand new Congress with the next election, did what it always had; it ducked the problem and passed the buck to the public.

Heriberto left the gallery that day in a state of absolute shock, engulfed in a cloud of gloom. He did not even bother to answer the queries of the newsmen who had come to regard him as a possible source of sensational quotations. He did not return the righteous glares he received from the other clerics. He went back to New York, to sit quietly and watch his worst fears materialize.

6:00 P.M.—Saturday—July 11, 2037—Rosemont Garden Apartments—Queens.

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Father Perez picked up the glass Stas had just set on the table in front of him. He lifted it high and held it up to the light, as if studying the liquor for clarity. Then his hand dropped and the glass swung toward his lips. In one toss, it was all gone.

"Hey! Easy, Father. That's rough stuff. You don't want to drink it like that. You ain't Polish."

"Does that make a difference, Stas?"

"Uh—no, I guess not, but whiskey takes a little getting used to. It ain't like rum or nothing."

"I was feeling frustrated. We're back where we began, Stas: just the two of us, you and me. The Old Society is finished. The others have given up. There are only a few of us diehards left."

Stas placed his own glass on the table and took a chair across from the priest. "For what it's worth, you were right. It happened just like you said. We got prohibition *and* we got twice as many trippers as we started out with."

"I would rather have been wrong, Stas. Believe me, I take no comfort in a victory of this sort. Prohibition never works unless the overwhelming mass of the population wants it to work. But you would know that, wouldn't you Stas?"

"Things are getting bad downtown, Father. The mob is moving in, just like they did with dope. They're buying cops. Not just the beatmen, either. Caesario had to retire. Somebody upstairs musta figured he was in the way. I hear they're gonna promote me; get me off the street. The word is I'm under consideration to go to personnel. There's an opening there for a lieutenant."

"Take it, Stas."

"I haven't got a choice, Father. You know what'll happen if I don't? I'll walk down an alley some dark night and never come back out. I've got better sense than that."

"Ah, yes; so you do, Stas. In the end, it is always self-interest that directs the course of human affairs. The individual learns to avoid pain, doesn't he?"

"Now what kind of a crack is that? You want me to get killed?"

"Uh—no; no, of course not, Stas. I was not referring to you; I was merely making an observation. Stas, we have been blind." He poured himself another shot and tossed that down, slamming the glass against the table top for emphasis.

"You're gonna get blinder fast if you keep that up."

"No, Stas. Stop. Think. Listen to me. We have been so intent on reaching a solution we forgot how the problem arose in the first place."

"I haven't. It was those implants."

"The implants are not the cause, Stas; merely the vehicle. They are neither good nor bad in themselves, merely available. And they did accomplish much good. They *have* sometimes been used beneficially. There are blind who can now see and lame who can walk, and you and I will live a little longer because these miraculous devices exist. But, none among us will live forever."

"What's that supposed to mean?"

"That in the end, death, the great democrat, will take us all."

"Yeh?" Stas quietly and unobtrusively moved the bottle off the table and placed it beyond the priest's reach.

"Stas, there is a man I want you to find for me."

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"Who?"

"His name is Curtis Morton, and he was once assistant director of the F.B.I."

"I remember him from those hearings. He ain't there no more?"

"No. I tried to reach him once before, just after the amendment passed, but he was gone, even then."

"OK. I'll see what I can do. What do you want him for?"

"Perhaps nothing, Stas, but find him if you can."

7:30 P.M. Thursday, October 21, 2038—Haakon County Jail

"Don't get many drunks these days, Father. Lately, seems most everybody is on something stronger. 'Course, South Dakota's a little different from where you live over in . . ."

"New York."

"Yeh. You folks had a real old-fashioned shootout over there the other day, I see on the news."

"We have them every day, Sheriff."

"'Steada the Wild West it's the Wild East, huh?"

"Can I see your prisoner now?"

"Sure. But that's about all you'll be able to do. He's got enough red-eye in him to keep him out all night at least."

"What's he charged with?"

"Drunk and disorderly, naturally. He was both. 'Course, if it was warmer we mighta let him just lay, but it gets cold up here at night in October."

"What about bail?"

"Fifty dollars cash—but surely you don't want to . . ."

". . . Yes, Sheriff, I do. Don't worry. I'll see that he attends any necessary hearings. He'll be all right."

"Then, he's your problem, Father. Hope you brought a wheelbarrow." He chuckled.

"As a matter of fact, I did." Heriberto counted out fifty dollars and handed it to the Sheriff.

Morton was still badly hung over, but he was finally functional, and past the point where he resented being forced back into reality against his will. He sat on the end of the couch looking out the hotel window, and tried to figure out why the priest had bothered with him.

Heriberto had gone out. He was returning now, carrying what looked like a foam hot-pack of food. Morton's stomach turned at the thought of anything greasy. "Please," he said to himself; "don't let it be fried chicken."

It wasn't. Heriberto had obviously done this before. It was hot black coffee, hot rolls and bland soup. Morton ate ravenously.

"Feeling better now, I hope."

"Much better. You know, I sort of forget to eat when I drink."

"I know. Here, these are vitamins. They'll help. Take some."

Morton did, chasing the capsules with great gulps of coffee. Then he put his cup down and asked the question that had been burning inside him since he first awoke. "Why?"

"Why?—Because you were once such a fighter."

Morton raised the cup again and sipped slowly. Without lowering it he answered. "I fought for the wrong thing and on the wrong side, didn't I? You knew that."

"Yes, I suppose I did."

"Well, it worked out just like you

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said it would. Instead of having legal fantasies and some regulation we've got illegal fantasies and no enforcement. That's why I left the bureau. I couldn't stand the hypocrisy."

"And also the reason you dived into the bottle?"

"I needed escape and it was better than the alternative."

"Alcohol is an old vice, Curtis; old and familiar. It is probably older than man himself."

"At least we understand it."

"I wonder. I wonder if we do. Old as it is it is still a problem, or was until the fantasies came along. Yet as recently as the last century we thought we could legislate it out of existence."

"I guess you fellows did OK even so, huh?" Morton chuckled.

"What?—Oh, yes. I have read that the consumption of sacramental wine rose substantially during those years." Heriberto was delighted to see humor creeping into the conversation. It was a good sign.

It retreated in the next instant.

"Why didn't you leave me be, Father? You didn't have to prove anything to me, you know."

"Curtis, it's not that; we were both wrong. In the long run, whatever we did the result would have been the same. I have been beaten as badly as you have."

"You didn't answer my question —why?"

"Because there may be another way, Curtis. Perhaps it will not work either, but it is hard to imagine anything worse than the present situation. I feel we must try it. We have nothing to lose."

Curt looked down at his ragged trousers and worn out shoes, and rubbed the wiry growth of whiskers on his chin. "I don't know about you, Father, but I haven't. What I fail to understand is why you want *me*."

"I said it before. You were once a fighter, and you are a man who once had high morals and lofty ideals. There are—were, none such as you in our Society of Man. None who had your background or your organizational skills. None driven as you seem to have been. We were naive intellectuals, not pragmatists. We were observers, not doers; talkers, not fighters."

"Father, it's gone too far. The hoods are in control. Everybody with the power to act is on the take from them. The country's economy would have collapsed years ago if it hadn't been for the fact that the biochips made robot industries practical, and if it wasn't for a few men and women who find that actually maintaining it is more exhilarating than fantasy.

"And it's not just in this country; it happened all over the world. Nobody cares about reality anymore. The vast majority of human beings don't even bother to breed anymore, because the natural sex act can't compare with what the dream machines deliver.

"Come to think of it, *that* might be a blessing in disguise. Think of it; extinction by apathy—all those years we worried about nuclear war . . ."

"That too, is the wrong answer, Curtis."

"Then you tell me. What is the *right* answer? Is there a right answer Father?"

"There is *an* answer. Whether it is right or wrong depends on what we do with it. I have always believed there is no such thing as 'intrinsic good.' If that

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is so, it follows that there is no 'intrinsic evil' either. But the use of a thing—that is where the potential for either of these things lies. We must use the dream machines, Curtis, and that is not an editorial 'we.' Now that the portable units are out the net has one great weakness: it is vulnerable to manipulation through the operators. What do you suppose would happen if certain of it's key people began to share *our* dream?"

1:30 P.M.—Tuesday, January 28, 2039—New York.

"Who is that one, Curtis?"

"His name is Emile Chounaird, Father. I guess you might say he's the original devil's advocate."

"Well, he looks ordinary enough. Where did you get him?"

"The same place you got me. Emile's another dried-out drunk, just like I am. Only, in his case the reason for the dive was guilt, not frustration. He's the guy who put it all together for Marathon International."

"I see."

"He was an operator for a fancy club over in southern California, back before any conversion programs had been written. But he anticipated their coming and tried to cash in on it. The boss at Marathon was a guy named Horace Young, who was a shade faster on the uptake than Emile was. After Emile got the net organized he was quietly eased out of control, but he stayed on for a while, collecting a salary and telling himself he was a big shot.

"But then came prohibition. The mob moved in on Marathon and Young was out. Naturally, Emile was out too. He told me that was when it hit him; the realization he was principally responsible for everything that was happening. Believe me, I know how he felt. Until he joined us he was a boozer."

"I wonder why?"

"Why? Oh, I see; you mean why booze instead of some palliative dream? Because booze is better for forgetting. A trip can put things into your head but it can't take the pain away."

"That's very interesting, Curtis. I am much reassured that we *are* on the right track. I will have a talk with Emile."

8:00 A.M. Sunday—April 29, 2040—St. Alphonso's Church—Brooklyn.

Emile peeked out through the curtain and turned back with a look of disgust. His "count" of the house was a short one. "We'll have plenty of spare hookups, Father. It's mostly old ladies. I'll bet there's not more than half a dozen trippers in the whole church."

"It is a beginning, Emile. We must make do." He turned to Sosnoski, who stood at the other end of the hallway, dressed and waiting beside a small four-wheeled cart. "Are you ready, Stas?"

The aging policeman nodded. He moved behind the cart and got ready to push it out to the altar.

9:00 A.M.—Friday, August 24, 2040—Marathon International—Burbank.

The "Boss" was not happy. A squat little man, with a blue jaw and a suit that hung like a gunny sack despite its cost, he let his anger show. He thumped

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a button on his desk. Instantly, the intercom boomed with a "yes, sir."

"Get ahold of Doyle; get him over here."

"Right away, sir."

Doyle must have been close. He appeared almost instantly, bug-eyed and apprehensive. "Y-you c-called, Boss?"

"C'mere Doyle. Have a look at this. Then, you tell me if we got a problem." With a flick of his wrist he turned his screen around so Doyle could see it.

"Uh—Well; maybe. Second quarter revenue does seem a bit depressed, but—"

"Depressed! It's down almost 15%. And it's the first *decrease* we ever had."

"Maybe there's an accounting error."

"Doyle! It's all machine. Machines don't goof up figures. Something's cutting into us, and I want to know what."

"Would you hand me the keyboard, Boss?"

The "Boss" picked up the slim instrument and passed it to Doyle, who made several entries and glanced at the screen. "Looks like we're down to almost nothing in the New York Metroplex. Boss, you're right; somebody's skimming."

"Now, how could anybody skim? You tell me how. And how do we get the drop in usage?"

"I didn't notice that." He made another pass across the keyboard. "You said profits were down. But yep; you're right. Time's down too, by just a hair under 15%. What do *you* think it means?"

"*I* think it means *you* better get busy and find out who's screwing up, Doyle."

"Y-yes Boss."

"And Doyle: do it yourself. Go there personally. Don't go making any calls. I don't want no slip-ups; I don't want anybody there to know we're checking."

"I-I'm on it, Boss. Right away, Boss. It'll take longer this way, though."

"I don't care. Do it right."

"Yes, sir?"

"Find Darone."

"Yes, sir."

The "Boss" waited nervously, which for him was a highly unusual state. All his life he had made *other people* nervous.

He watched the clock on the wall. It was eating up minutes far more rapidly than it should have been, and still there was no Darone. A half-hour passed before the door popped open and a sleazy little man sauntered in; sauntered, not walked. He was wearing a floppy hat that made his head look small, but which threw his prominent nose into a shadow and made it look even bigger than it was. "Hi, Boss."

"Where were you?"

"I was hooked up. I gotta keep in shape, you know." He rubbed the back of his neck.

"Yeh. OK. I understand." And the Boss did. Frankie's job was to enforce company policy. To do that he had to know where everybody was, all the time. And he did this by plugging into the network a couple of hours a day while the machines updated his recent memory. It wasn't a fantasy function. It was just that Darone's mind had a peculiar twist to it and in this one respect his augmented memory was eidetic. The

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Boss didn't let his people trip. It wasn't good for the organization. Most of the other families didn't care, so this gave him an advantage.

"Frankie; Doyle's been gone for three days."

"So?"

"I sent him to New York."

A look of surprise washed over the little man's face.

The Boss noticed. "He went incognito," he explained, "on my orders."

"Yeh?" Darone understood, of course, that top "management" sometimes did this but he was mildly curious that it was Doyle. Doyle, for all his involvement, was still an outsider. He didn't have the right genes.

"Yeh. He should have been back in a day. Have you got anything on the net that might explain why he didn't come back?"

Darone squinted, closing his eyes for a moment. This was the way he prompted his memory. He opened them again. "Not a peep, Boss. Everything's quiet out there. Nobody's moving. Uh—in fact, things are a little too quiet. Naw! Couldn't be."

"What couldn't be."

"The net—rigged. There ain't no way to rig the net."

"Then, go get Doyle."

"Boss; how'm I gonna find him?"

"How do I know? How, is your problem; you solve it. Go get him, and bring him back. I want to talk to him."

Darone turned and went to the door. He turned as he opened it, to assure the Boss once more that he would not fail.

But it seemed to the Boss that Darone must have failed. In any event, he did not return. So, in desperation the Boss himself turned to the telephone; something he'd really not wanted to do. He first called the Newark boss, whom he supposed close enough and interested enough in his big neighbor to keep himself informed.

Mario Andreano seemed both surprised and pleased he'd called, but he wasn't very helpful. "Trouble? Naw; we got no trouble out here, Sam. Everything's fine; working smooth, just like always."

"You're billings are way down."

"It's not just ours, its everybody's. Lots of people are out of work; times are getting tough, Sam."

"Well, how come I don't see it here in California?"

"Beats me, Sam. Maybe it hasn't caught up yet. These kinda things are funny."

"Yeh. Maybe. Talk to you later, Mario."

Within a half-hour the Boss had talked to friends in Boston, Philadelphia, Trenton, Baltimore, and several other east coast cities. According to all of them things were fine. He began to feel helpless. Aside from going there himself, for a personal look, there wasn't much more he could do.

So he sat, and waited, and wondered and fretted—and all the while business got worse.

3:00 P.M. Thursday, November 1, 2040—Queens.

"I don't know about all this, Father. It seems to me that sooner or later we're gonna have problems. It surprises me we made it this far without trouble."

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"Have faith, Stas. Curtis and Emile know what they are doing, and they assure me everything is under control."

"W-well, maybe it is, Father. But I notice you never go out into the streets anymore. I do, and I tell you it's like walking through a funny farm. All those people standing around like zombies looking up to heaven. What's gonna happen when we can't control them all?"

"Ah, but that is the beauty of this system, Stas. We have *perfect* control. These people are happy. Not only that, they are good. Everyone is good. The trippers are good because they are enjoying a powerful fantasy. The non-trippers are good because they can finally see a solution to the problems which might have doomed us as a race."

"But it's gonna get cold, Father. And what if we can't bring these people out of it? We are gonna do that, aren't we? I mean, when the situation's under control again?"

Heriberto met the question with absolute and devastating silence.

"Father?"

"I have been dreading the moment when you would ask that question, Stas. Now that you have I realize that I must answer you truthfully. No, Stas. We will not bring them back. They must stay as they are, for as long as they live. We will care for them, of course, but they can never be trusted again."

"Father, you . . ."

"I have deceived you, Stas. For that I am truly sorry. It hurts me more than anything I have ever done. Yet, it was necessary that you be deceived, or else added to the numbers who walk the dreams. For you, there should be something better than that. You are a simple man, but a moral one, and in that admission I am truly humble.

"But you see, there have been times like this before; times in the past when all of humanity was wicked; when God was compelled to do away with most of what he had made and start anew. The Bible tells of the flood of Noah, and of the burning of Sodom and Gomorrah.

"This time we are the instruments of his purge. You must agree that this time it is much more humane. These dreamers walk a path of peace, with every human need provided. Does it matter that when they are fed they believe they are eating loaves and fishes? Does it matter that when we exercise them to keep them fit they believe they are tramping the hills of Galilee? Does it matter that they believe it is summer, when the best weather control can manage is spring?"

"You said it was just for a little while."

"Yes, I did. I said that, and when I said it I truly believed it. I would still do it if it were possible, but it is not possible. When we started this we did not know how many of them there really were. Now we do, and we know that we are far too few to control them in any other way. We must face facts, Stas. We have rescued these people from the Devil, and we cannot simply hand them back to him again."

Stas's face took on a bewildered look. As the priest had said, he was a simple man, but he did at last understand this, and he didn't like it. Without another word he turned and left the room.

* * *

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2:00 P.M.—Thursday—December 20, 2040—Lower Manhattan.

"Look at him, Father. He's so drunk he can hardly stand. They all are. We have to do something. We could implant him right now. He'd never even feel it."

"No. Not him; not Stas."

"But why? Every day you come down here and look at him, and every day you leave him another bottle, so that he can stay like this until the next time you come."

"You said it takes away the pain, Curtis."

"I was wrong. I didn't know what I was talking about. I didn't see myself like he is. If I had I would never have said that."

"But you were not wrong, Curtis. It takes *my pain* away. Because it is not his own guilt Stas carries, but mine. I am the betrayer. I am the tyrant. Don't you see what I did? I divided the world into parts. Some I made mindless, because they would not otherwise obey. Some I made keepers because they would obey if they were fearful of becoming like the others. But there were others, like Stas, who obeyed because they were good. The others I can destroy, but not these.

"But he's destroying himself."

"Perhaps he will. But the choice is still his. Curtis, you know that as time goes on more and more people will join in the dream. They will do this because they will see the others and will envy them the placid existence they seem to enjoy. The nature of man is such that it can be no other way. And have you asked yourself what will happen when there are too few to maintain those who already indulge?"

"Yes. I've thought about that, Father. But I'd always hoped that in the meantime—"

"We won't. It has already gone too far for that. We can't stop it, and I am not certain I would if I could."

"But there are billions of them already. They'll die."

"I know. But they will take something with them that the Earth never needed and should never have had. When they die, so will the dream machines. Those who are left, if any are, can start again, and do so in the knowledge that fantasies are not the way. When the world has been purged it will be composed of better and more righteous men, but unlike times past there will be no destruction. It is not the end of the world, Curtis, but a new beginning, with all the misfits culled and only men like Stas surviving."

Morton turned his head away. He couldn't look at Heriberto anymore.

10:00 A.M.—Friday—December 21, 2040—Queens.

Emile Chounaird adjusted the thin strand of fibers that protruded from Heriberto's neck, mindful that the puncture was fresh and the flesh swollen. "There," he said. "It's done."

Curtis Morton had been watching. Through it all he hadn't said a word. Now, he had to speak. "What's he dreaming? Can you tell?"

"No. Not without hooking in myself. And I'm not about to do that. But, generally speaking, when left to himself a man will choose to dream what pleases

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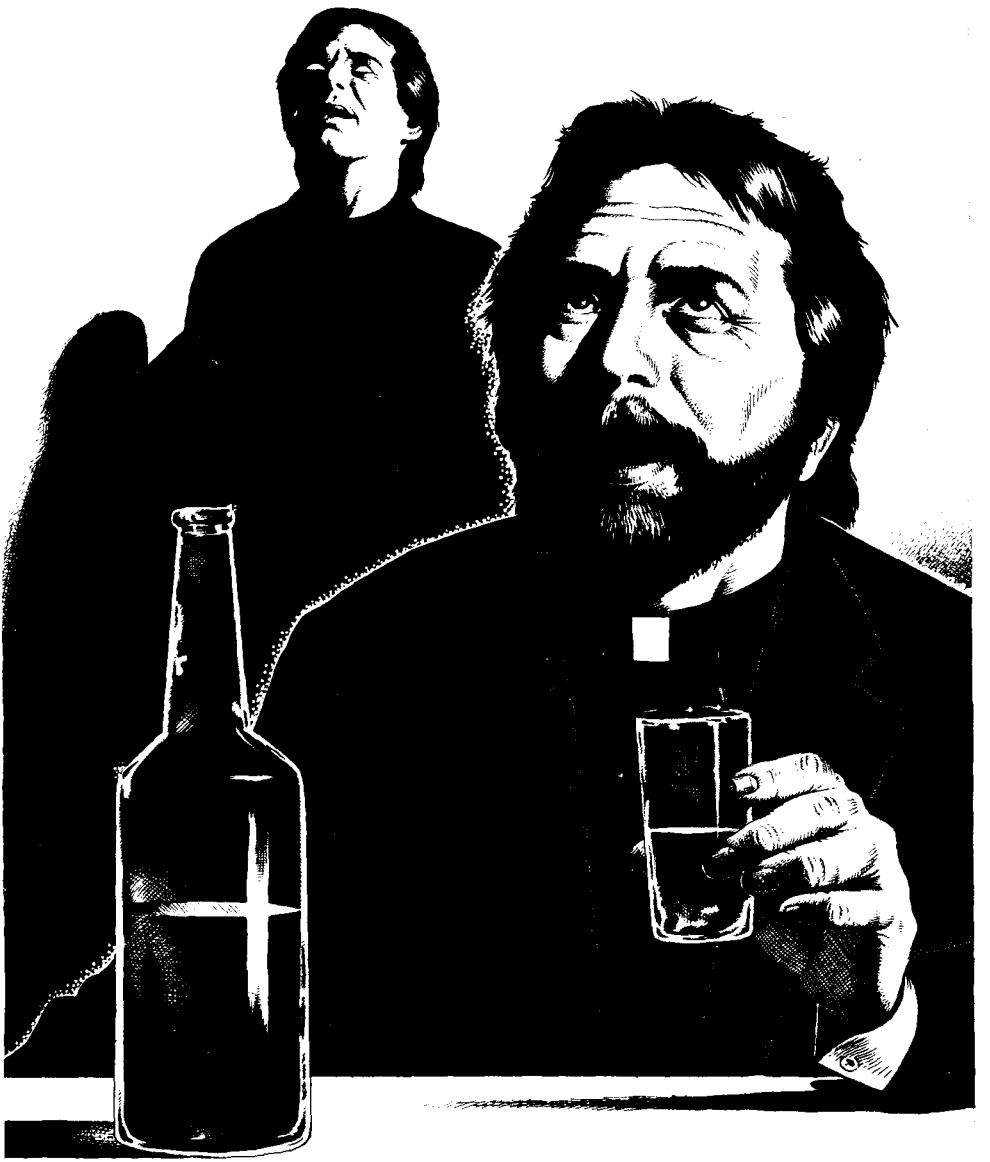
him most when he is awake. But, why should you care? You know what he did, and you know what it means to us."

"I care. That's all." And he *did* care. Heriberto had once called him a fighter. He knew that was true. He was a man of strength. He knew he could not simply give up and play the role that Heriberto had cast for him. He could not



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allow the world to descend into chaos, *as it inevitably must if the present course* of events continued. He could not remain a passive observer. He would have to act.

11:00 P.M., August 12, year one of the reign of His Most Excellent Majesty, Curtis, Rex—The Royal Throne Room.

"No, no." The king was yelling into the microphone. "You didn't listen. I said to plant the entire acreage in rice. You can't change the diet of a whole people overnight. Wheat might grow better with the present climate but these people eat *rice*. We'll grow *rice*. Understand?" He cut the connection, and turned to the man standing behind him.

"I'm sorry I ever took this job, Stas. I never worked so hard in all my life. That was the governor of Assam. Used to be a farmer in Nebraska. I'm going to have to get rid of him and put in a native, if I can ever find one who's qualified. We've got so few stable people left."

Stas nodded. "I know what you mean, Curt. I got my own problems. I had to bust the head operator over in Paris today. He was settin' himself up a harem. Can't have that."

"Definitely not, Stas. But isn't it great to have crime again, even if it's only a little bit, and under control?"

"Better'n a planetfull of holy zombies, Curt. God, when I think about what almost happened I get th' shakes. And Heriberto was gonna just let it go. If you hadn't stepped in and changed the programming . . ."

". . . and become the slavemaster, Stas. That's what I am, you know. You and I are the only free men on Earth. *Did you ever stop to think of what will* happen when we die."

"Once or twice. I try not to. You done working, Curt?"

"For today, yes. Come. I have a bottle." He led the way out of the room and Stas followed along like a pet dog.

In Curt's apartment was a big table, and three comfortable chairs. When they arrived Heriberto was already seated in one of them, a blank expression on his face.

"Stas, someday we'll have to do something with him. We can't leave him like this forever. It's depressing."

"Why do you keep him here, anyway?"

"Where else could I put him, where I could be sure he was safe. Besides, I keep hoping something might come up."

" 'Something'? What could we do except bring him out of it? And you know he wouldn't like what we did."

"For now, let's give him a glass."

"Why? He'll just sit there with it."

"I know, but do it anyway."

Stas did. And to his surprise, Heriberto raised the glass to his lips, and drank it all. "It takes away the pain," he said. "There is hope after all. Long live our beloved king."

"I thought you would be pleased, Stas. I've been experimenting a bit in my spare time, altering his fantasy little by little. It seems to be working, and soon I hope to have his personality rebuilt to the point where he can be useful again. Of course, such a thing wouldn't work for the masses, but . . ."

"It takes away the pain," Heriberto said again. ■

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Michael P. Kube-McDowell

LIFEBOMB

Problems of life
and death may have
more than one kind of solution.
Internal and external,
for instance.

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Lev Miller rested his face in his hands and his elbows on the desk for a long moment. Sucking a deep breath through his fingers, he willed his overweight and underexercised body into a semblance of energetic health, then tabbed the call switch to the outer office.

"My appointments today, Kellie?"

"Congressman Wiley at 10 A.M. —that's about the petition for an exception to the strategic minerals sales restrictions," answered a pert-voiced secretary. "And the lawyers handling the wrongful-death suit over the mine collapse will be here at two."

"Thank you." He could not get the tiredness out of his voice. Last night's angina attack had been the worst yet, waves of pain racing up and down from his chest to his neck. Even when the pain was gone the fear had remained to keep him wide-eyed in the darkness.

"Oh, and Mr. Miller, that insurance agent from the Assurance would still like to see you. He has a letter of introduction from the company carrier this time."

Lev sighed expressively. "I'm not up to seeing an insurance salesman. Send him away."

"Yes, sir, if that's what you want. But he'll probably just camp in the waiting room again until you see him." She lowered her voice and added, "He really kind of gives me the creeps."

"If he's bothering you, just call Security."

"He's not *bothering* me, exactly, it's just that he's always *there*—"

Lev sighed again. "Do you want me to give him a few minutes so we can be rid of him, then?"

"If it wouldn't be too much trouble—"

"Send him in."

The agent wore a bright red sports coat with an embroidered emblem emblazoned on the pocket. Contrary to form, he did not wear the insipid insincere smile endemic to his profession.

Nodding to Lev and then ignoring him, the vistor removed an instrument the size of a dictation recorder from his briefcase. Holding it in front of him and studying the dial as he waved the unit slowly back and forth, he walked the periphery of the room. Finally he nodded to himself, snapped the cover closed, and looked up at Lev.

"Okay," he said, extending his hand. "Melvin Beech, Vita Eterna Assurance. Pleased to meet you, Mr. Miller."

Lev took his hand reluctantly. "I haven't much time to spare you, so please make your pitch."

"I'm a man of few words. I only ask you to consider your position. A 55-year old wife with no work skills—two boys in college—you with all this responsibility." Beech's voice dropped to a whisper, as though he were sharing a secret in a crowd. "A man like you—it would be a shame for something to happen—"

"Accidents happen," Lev shrugged, settling back in his chair. "I can't live in a world with no sharp edges or moving objects."

"I understand that. That's why you need life insurance," the salesman said suggestively.

Lev's voice showed his boredom. "The company pays for two $10 million

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policies on me, one with my family as beneficiary and the other in its name—''

Beech waved his hands. ''No, no—that's *death* insurance. I'm talking about something else.'' He smiled knowingly. ''You don't want something that benefits your survivors. You want to make sure that there are no survivors, because you didn't die.''

One corner of Lev's mouth curled upward in a smirk. ''Does this call for a contract signed in blood? Should I be looking to retain Daniel Webster about now?''

Beech smiled tolerantly. ''Do you know the old joke that says the only thing wrong with the human body is that it doesn't come with a warranty? This is no joke, Mr. Miller. We will assure your life. If any part of your body is damaged before you complete your actuarially predicted lifespan, we'll repair or replace it.''

''And what do *I* have to do to reap these amazing benefits?'' Lev asked skeptically.

''It's very simple. You wear a three-pound biomaintenance unit wherever you go, in the middle of your back,'' Beech turned his back to Miller. ''I'm wearing one now.''

Lev saw only a hint of a bulge between Beech's shoulder blades. ''Show me.''

There was a popping sound, and the back of Beech's jacket exploded. A puff of smoke marked the center of an expanding flower of fabric. An instant later, a bright red cocoon stood where Beech had been.

Cautiously, Lev moved from behind his chair to examine the apparition, the surface of which pulsed rhythmically. It was the same height as Beech, and shaped more or less like a human torso—He poked at it, and it rebounded from his touch as though under pressure.

He jumped back, startled by a ripping sound. A slit appeared along one side of the cocoon, and an arm poked through, then a head. Beech looked up at Miller, winked, and grinned.

''What the hell was that?''

''The designer calls it a lifebomb,'' Beech said, continuing to disengage himself from the now-limp fabric. ''Full deployment in six-thousandths of a second. Tougher than steel from the outside—needs a special solvent to open it.''

''A very—impressive demonstration,'' Lev said carefully.

''You saw only the most superficial feature. If this had been a real emergency, a cryo cylinder would have dropped my body temperature far enough to trigger the diving reflex.'' Beech placed the rolled-up cocoon and the shredded remains of his shirt and sport coat in his bag and retrieved replacements.

''The enclosure itself serves as an air splint and pressure bandage,'' he continued while dressing. ''If you need it, it can even perform CPR for up to 12 hours. Once triggered, the lifebomb sends out a continuous radio signal to our offices and the nearest emergency services, providing both with your location and biotelemetry.''

Lev felt his way unsteadily back to his desk. ''What sets it off?''

''A pair of small surgically implanted sensors monitor your vital functions. Plus there are certain environmental conditions that will set it off—potentially

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damaging accelerations, extremes of temperature, poisonous gases—''

''You can't guarantee it against all perils.''

''Naturally not. The guarantee is void in the event you find yourself within five miles of a nuclear explosion of one megaton or greater. All other eventualities are covered.''

Lev's eyebrows came together in puzzlement. ''I'm not restricted from flying?''

''What sort of businessman could accept such a condition? You might be interested in a series of tests we performed with pigs as test subjects. Nine out of ten survived a 10,000 foot free fall. You can skydive, mountain climb, or surf in Hawaii if you want.''

Lev chewed on his thumbnail. ''But it doesn't always work. What happens if I'm wearing one and I die?''

''We consider that extremely unlikely, you understand. And of course you'd be no worse off than you'd have been without the lifebomb. Nevertheless, we've arranged for your estate to be $1 million better off.''

''If I need a new arm? A liver? Heart?''

''Provided. Our option to provide a temporary prosthetic or permanent bionic substitute,'' Beech said. An unpleasant grin curled his lips. ''Think of it as a service contract on an organic machine. If we can't repair it immediately we'll provide a loaner.''

Lev laughed uncomfortably. ''I suppose it's a little hard to buy human hearts off the rack.'' His countenance darkened. ''Look, why haven't I heard about this before? This is real ''Good Morning America,'' *Popular Science* cover story material.''

''The company prefers to keep a low profile. All its stock is privately owned, and we don't advertise. We prefer to select our clients rather than the other way around.''

Lev pursed his lips. ''Does that explain the search for bugs?''

''Industrial espionage,'' Beech said shortly. ''You know that patent protection is worthless in this age. Look, Mr. Miller. We believe in what we're offering. We believe you're the kind of man who can benefit from it. What do you say?''

''I say you haven't told me the bottom line.''

''For you, Mr. Miller, there is no charge.''

A muscle in Lev's right cheek began to twitch. ''Now I know this is a scam.''

Beech bristled indignantly. ''Not at all. If we were to sell the unit—which we won't, to protect our technical secrets—we would ask for half a million dollars. As a contract service, we value it at $200,000 per year. But we are a new company. You understand the importance of a track record. So we've selected a pilot group to which we're offering the service free.''

''Including me.''

''Yes. But don't think you'd be a guinea pig. The lifebomb is fully tested, and there are more than a thousand people walking around wearing one. You'd be surprised how many of the names you'd recognize.''

Lev hesitated and drummed his fingers on the edge of the desk. ''Leave the paperwork for me to look over. If I decide I'm interested, I'll call you.''

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"I'm sorry not to have better news for you, Lev," Congressman Wiley said, hooking his interlocked fingers over one knee.

"How big a contribution from MINEPAC does it take to get a little cooperation on the Hill?" Lev snapped angrily, pushing himself back from his desk.

"Now, Lev, no sense in losing your perspective. I did what I could for you, but we're up against two much right now. The Speaker is on the warpath against special bills, and this particular one would be in trouble anyway because your trading partners don't exactly hew to democratic ideals."

"That's never mattered before. Christ, if we followed that guideline we couldn't sell a tenth of what we move overseas. Don't your buddies know that?"

"Of course they do," Wiley said soothingly. "You can sell the Communists as much as you want of anything we don't want—iron, copper. But not molybdenum. Not in an election year. They don't want to get hurt by a vote on an export they can't even pronounce."

"So what do you expect me to do?" Lev struggled to inhale, his epiglottis seemingly undecided whether to allow a swallow or a breath.

"Ride it out until November. I'm sure I can get your bill attached as an amendment to a funding bill after the election."

"Goddamn it, we're hurting right now. We need that market."

Wiley held up his hands in supplication. "I'd like to help you—"

"I know, I know." Stomach acid splashed into Lev's esophagus and the familiar sensation of heartburn spread through his ribs. He stabbed at the intercom. "Kellie, a glass of milk, please, quickly."

The grim faces of the two lawyers told Lev that his afternoon was going to be no better than his morning.

"We met with the attorneys representing the families of eight of the victims yesterday," the senior partner said. Lev could never remember the lawyers' names; they were so clone-like in manner and speech that he thought of them as Tweedledum and Tweedledee. "We think we may have worked out the terms of a settlement that would be acceptable to them and would end the hemorrhage for the company."

"Go ahead."

"Six mil. It works out to $750,000 per family. They agree to drop the present and any future suits, and they won't insist on an admission of responsibility."

"Are we responsible?"

The lawyer shrugged. "Does it matter?"

"Are we responsible?"

"Not until a court says we are," said Tweedledee. "The presumption of innocence works for us, too."

"What about the ninth family?"

Tweedledum reclaimed the floor. "We should be able to use this settlement as a lever to get them to talk, at least. We should be able to make them wonder whether they'd end up with nothing if it goes to trial."

"Are you saying we could win? I damn well don't want to hand over six

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million dollars if we could get out of it by hanging in longer."

"They're smart enough to insist on a jury trial, and it's awfully hard for a big conglomerate like Resources Unlimited to win in that arena. Juries always want to soak the company for the little guy. Your typical juror doesn't invest in stocks."

"Not to mention what sort of bill we'd run up for legal services," Lev said, one eyebrow arched.

"That's a consideration, too."

"Goddammit, I hate this kind of gouging. You know that two of them were responsible for inspecting the run that collapsed and killed them?"

"We used that very effectively during the negotiations," Tweedledee offered.

"Poetic justice, I'd say. Their insurance paid off. We don't owe them a penny."

"You know that and I know that. Our problem is with the twelve men good and true."

Lev snorted. "Leave me copies of the proposal and I'll take it to the executive committee." As they left he grumbled to himself, "No exports and six goddamn million dollars in blood money. Politicians and lawyers—a plague on both your houses."

Jesus.

The pain felt like a knitting needle was being driven again and again into his breast, doubling him over, his clenched fist crinkling the Assurance contract he was holding.

It faded but slowly, leaving a dull ache behind as a reminder. Lev rubbed the spot gingerly and thought about the three-egg omelets and the sauteed baby beef liver. He imagined his coronary arteries, their walls thick with whitish deposits, the red blood cells tumbling over each other to force their way through an ever-smaller passageway—

Dammit, I can't change my whole life. I know what they'll tell me. I know what they want.

He sat in his recliner in the study, arms crossed over his chest, and thought of Leanne asleep in the big bed upstairs. *You always told me which way I was going, but never pushed me hard enough to make me change. But that doesn't mean you deserve to be a widow this early.*

Getting up slowly, he crossed the room to where the phone waited inside a polished hardwood enclosure.

I can't slow down now. There's too much that has to be done. I just want to see the company through the rough times. I'm going to take early retirement, but there has to be something to retire from.

Fumbling in his wallet, he found Beech's business card and dialed the number on it. Call any time, he'd said.

"Vita Eterna Assurance. May I help you?"

Lev identified himself and asked for Beech.

"Just a moment, Mr. Miller, and I'll locate him."

A change in the background hum told Miller the call had been transferred.

"Hello, Lev."

"Beech? What kind of medical exam do I have to pass?"

"None."

Instead of wondering at that unexpected news, Lev celebrated silently. "I want to do it. As soon as possible."

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"We'll contact your doctor—"

"Skip that if it'll speed things up."

"I can schedule installation for tomorrow morning."

"That's fine. That's fine."

"You sound like a worried man, Mr. Miller."

Lev laughed acerbicly. "I don't have to be now, right?"

The insertion of the flexible tubelike monitors required but two tiny incisions and took but 20 minutes. Then the fat-cheeked surgeon gave way to a sallow-eyed technician, who completed the installation by anchoring the contoured lifebomb to Miller's skin itself.

"What if I get an itch?" Lev joked uneasily, watching the process in a mirror provided him for that purpose.

"The pack will numb what few nerve receptors exist in that part of the back," said Beech, standing by the operating room door.

"I suppose this means an end to backrubs and massages," Lev said in another attempt at humor.

"You should complain," grunted the technician. "Wish I could afford one. Be nice to know you're not gonna check out before your three-score and ten."

"Many of our clients report that they're enjoying life more now," Beech observed.

"The important thing is that they can report at all, right?" said Lev.

"Of course," Beech agreed. "If simply surviving is what you want, you should be very satisfied."

It was three days before Leanne discovered her husband's new companion. He usually rose before her, often worked long after she was in bed, slept in a separate bed. At this stage of their marriage, the primary points of contact were breakfast, ritual afternoon phone calls, and the checking account.

But from time to time, she would rise earlier than usual and came to his bathroom to talk about inconsequentialities while he showered and shaved, an echo of a closeness that was more remembered than real. While standing at the mirror with a towel around his waist, he saw the door swing open from the corner of his eye and felt cold air at his feet.

And heard Leanne shriek, "What *is* that?"

Lev twisted toward her, his face still half-covered with shaving foam. "Hmm?"

She was pointing to his back with a horrified expression on her face. "That—that—*slug!*"

Wearing the lifebomb had already become something beneath notice for Lev, and it took him a moment to realize what she meant. "Don't get excited. It's just—it's something my doctor wants me to wear." Seeing her confusion, he added, "It monitors my—my blood pressure."

Though calmer, Leanne looked dubious. "It's ugly. And it reminds me of a book I read when I was a girl. A scary book."

Lev resumed shaving. "I won't be wearing it forever. Till I retire, at most. Maybe just a few months."

"I don't like it."

"Oh—so you *want* me to drop dead."

"If that's what you're worried about, I've got a better solution. Quit and let's do that traveling we always talk about.

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Then the only thing raising your blood pressure will be looking at me," she said, and posed vampishly.

Lev sighed. "Be serious. I can't leave the company now."

"Yes, you can," she said. "But you won't. Because you've got this stupid macho idea that the money you make is worth more to me than you are."

"You know I just can't leave a job half-finished," Lev said lightly.

It was an old argument that had mellowed into ritual, and neither of them invested it with much emotion. "Just don't expect me to hug your *slug* with the same warmth you used to get," she said, and flounced out of the room.

Ever since the first twinge of angina had tugged at his fears two years ago, Lev Miller had considered the heart attack it portended inevitable. Or, if not inevitable, then at least the concomitant penalty for the life he had freely chosen.

Before meeting Beech, Lev had found a macabre fascination in imagining, at odd moments during the day, what the reaction of those nearby would be if the attack came *right NOW*. Sometimes he would play it out even to the arrival of the EMTs and the pronouncment of his death or survival.

With the lifebomb tucked securely between his shoulder blades, he had, without conscious decision, given up that game. Even so, he would probably never have played it the way it really happened. In the game, it was anger or bad news that always brought it on, a fight with Leanne, a son flunking out, a comptroller caught embezzling.

But when it came for real, it was nothing more stressful than driving home in his silver Audi, listening to international news on his AM-FM radio and thinking about dinner.

At first, the heart attack was less painful than the most recent angina—just a knot between his shoulder blades, like a snag in the weave of his body. But the knot quickly grew to encircle his torso and became a crushing vise, his vision narrowing to shadowy tunnels and an icy sweat popping out all over his skin.

Time expanded, and he watched himself lose control of his speeding vehicle, his hands gripping the wheel tightly but no longer steering, the warning beep from the oncoming lane of traffic. He had time to think once, *I'm dying, why hasn't the damn thing fired*, and then it did. He remained conscious just long enough to experience a terrifying moment of claustrophobia as the lifebomb's shroud enveloped him, and then the stillness and the darkness were one. When his car hit a delivery van broadside and a moment later exploded in flames, Lev Miller was already somewhere else.

Light returned in stages.

Ovals of white hovered over him like sprites, then hastened away. Comets of color streaked across his universe. With light came pain, waxing and waning but never ending. In time the light returned in fullness and he could see the reasons for the pain. The ovals became faces, Leanne, his son Tony, nameless doctors and nurses.

"I'm not letting you get away again," Leanne said. He could see that she was holding his hand, but could not feel it. He closed his eyes without testing his voice or any other part of his body.

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In the private moments when he drifted between excruciating light and insensate darkness Lev could think, and what he thought most about was why he was alive.

"Beech," he croaked one day. "Bring Beech."

His visitors misunderstood, and the next day a poster of the Virginia shoreline went up on the wall and the sound of the surf was piped into his room.

"Bring Beech. Must talk."

Leanne was still wondering what he meant when Beech appeared of his own accord.

Beech pulled a chair up alongside the bed.

"Sorry this happened. I wanted to know how you were doing."

"Hurt."

"They tell me that either the crash or the coronary would ordinarily have killed you. Can I help in any way? Are you being taken care of?"

"Explain. About lifebomb," Lev said with an effort, his tortured breaths breaking each sentence into fragments. "Should have wondered. Why a secret. Humane invention. Why not. Give to everyone."

"That was the idea, at first," Beech said with a hint of wistfulness.

"You. Invented."

"I was part of the team." Regret touched his features. "We just wanted to keep people from dying silly deaths. My generation lost Hendrix, Joplin, Croce, Belushi, Harry Chapin—all silly deaths."

"Expensive. To develop. Couldn't build. Without help. Your venture. Capital."

Beech nodded, though the motion was too subtle for Miller to see. "We went to the big foundations, but all we got from them was a pat on the head. Too speculative. Too impractical."

"Who. Paid."

Hanging his head, Beech rubbed the back of his neck.

"Can't hear. Who paid," Lev repeated.

Beech avoided looking at the man in the bed. "Insurance companies."

"Vita. Eterna."

"No. *In*surance. The National Association of Life Insurance Underwriters. They paid for everything." He hesitated. "They still do. Private stock issue—they own fifty-five percent of it."

"Why."

Beech straightened up as though tired of cringing. "You were a businessman. Add it up. It's cheaper to keep you alive. They identify heavily insured individuals with high risk factors and hire us to keep them alive."

"Save. Twenty million. On me."

"You're a high risk. Forty pounds overweight, out of shape, Type A personality, pressure job," Beech recited briskly. "Even without access to your company physicals, anyone can tell you were ripe for a stroke, heart attach, perforated ulcer. Add up the numbers. Ten years at $200,000 a year is a lot less than the $20 million it would cost them if you died. This way you're a sure bet to live until the benefits terminate."

"Then I terminate."

"Maybe not. And even so you'd have had years you wouldn't have had any other way," he said defensively. "You can't blame them if they try to reduce

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the risk as well as spread it out. Who insures the insurers, after all?''

''Policy. Renewable.''

Beech shook his head. ''Not indefinitely. Read it. At some point either the coverage ends or the benefit is slashed.''

''You keep me alive till then. Leanne gets. Nothing.''

''That's what our contract says.'' Beech drew a long, slow breath. ''We hope that in ten or twelve years we'll be able to cut the apron strings and choose our own clients—including some people who could never pay for it themselves.''

Lev closed his eyes, and for a moment there was silence save for the sound of surf. ''Am I. Wearing one.''

''Of course. We installed another unit before you left the operating room.''

''Want. Off.''

''I can understand if you're upset. Most clients who find themselves where you are do.''

''Leanne. Deserves better.''

''She deserves you alive.''

''Lifebomb. Excuse to be stupid. Know a better way. Want it off.''

''I can't recommend it.'' Beech shook his head vigorously.

''Want off.''

Beech blew out a breath between pursed lips. ''You can have it removed. But I have to warn you that the insurance companies have already won a ruling in another case that removing a lifebomb is an act of suicide, like disconnecting a respirator. It'll void the policy. If you die she'll still get nothing.''

''Don't intend to die. A silly death. Quitting. Resources Unlimited.''

''You're a type A if I ever met one. People like you don't know how to slow down.''

''Suddenly. Motivated to. Learn how.''

''I suppose.'' Beech got up to leave, then stopped at the door and looked back. ''We didn't want it this way. Road to hell and all that—''

''Businessman. Understand.''

Beech chewed at his lower lip. ''If anyone asks, I didn't tell you this. But don't ask for it to be removed until you're out of here and out of danger. Then you can quit, the insurers will cancel the contract covering you and we'll have to remove the lifebomb. And your private insurance will still be valid.''

Miller closed his eyes, a beatific expression on his face. ''Thanks but. Already figured. How you think.''

Beech nodded thoughtfully. ''I'm glad you're alive, anyway.''

''Glad I'm alive. To be glad.'' ■

● Arthur C. Clarke once said that any technology sufficiently advanced to a more primitive culture would be indistinguishable from magic. However, there's always the remote possibility that the technology *is* magic.

Stephen A. Kallis, Jr.

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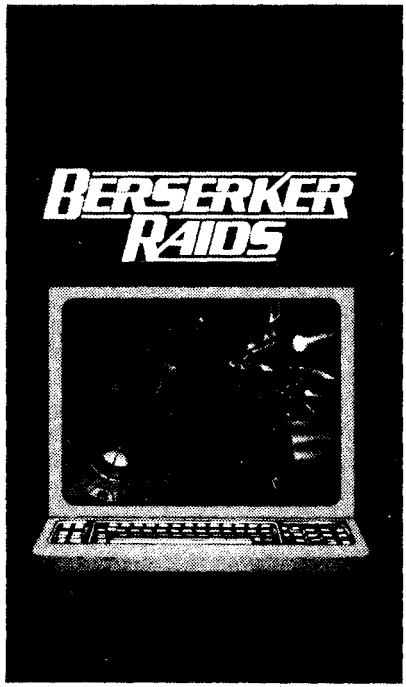
ON GAMING

(continued from page 97)

form of constantly updated text on the computer screen. The object is to use the *Judith* and its nine fighters to draw off the pursuing Berserkers so the *Hope* can flee to safety.

Unfortunately, after you give your orders, you can only wait for the results. You may also have to play a few games before you find out which tactic is best to use against the Berserkers. *The Bridge* phase ends when either the *Hope* arrives at its destination, or the *Hope* is destroyed, or the *Judith* is attacked and boarded. The odds are against the *Judith*.



The next phase is called *The Maze* and occurs if the *Judith* is invaded by Berserkers (a likely occurrence). You must move rapidly from the bridge to a hangar deck two levels away where you can escape on one last fighter stored there. This part of the game is a three-dimensional, real-time, three-level maze. Without warning, Berserkers can suddenly appear as you attempt to navigate the unmapped maze. You should also try to get to your cabin for a critical experimental module you'll need in the last part of the game.

The last part of *Wings Out of Shadow* does not appear unless you successfully escape the doomed *Judith*. If you made it out on the last starfighter, you enter another arcade-style shoot-and-dodge game with really nice graphics called, appropriately, *The Last Battle*.

If you were able to get that experimental module out with you, you have a chance to destroy the remaining Berserkers and save the *Hope*. You can skip the previous parts of the game and just play *The Last Battle*, if you desire. This is a good feature since *The Maze* is quite deadly and it can be very frustrating to be constantly stopped in the game just short of the final "chapter."

Although design quality is uneven, the way that the four games link and gradually build your experience is excellent. Narrative segments between each of the four phases change each time the game is played, depending on the actions you take. In effect, you develop your own story as you interact with the computer. Overall, *Wings Out of Shadow* gets a very positive rating. It's worth having and worth playing. ■

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The Alternate View

COMING: YOUR BEST FRIEND

G. Harry Stine

The Greek philosopher Zeno once defined a friend as "another me."

Biotechnologists are very close to creating the best friend you could ever have: another you.

This is because, contrary to popular belief that the highest organisms yet cloned have been carrots and salamanders, biotechnologists are cloning mammalian cells. The surprising fact is not that they're doing this, but that they've been doing it since 1948! K. K. Sanford, W. R. Earle, and G. D. Likely reported this in the *Journal of the National Cancer Institute* (9:229–246) in that year, but no science reporter caught it at the time. I discovered it in the March/April 1984 issue of *BioTechniques* in connection with an article by Robert J. Klebe of the University of Texas Health Science Center in San Antonio. Klebe and his colleagues have been both cloning and replica plating mammalian cells at the rate of one clone every ten to fifteen seconds.

So much for the background. And so what?

So if the biotechnologists are that far along in development of cloning techniques, it can't be very far in the future that these techniques are developed to the point where organ transplant surgical techniques undergo a massive change.

At the moment, surgical organ transplant technology amounts to cannibalization.

Don't let that phrase throw you and cause you to whip off an indignant letter to me or the editor demanding that, because we're not cannibals, I should retract that statement. That's not what I meant. I used the term in its technical sense as applied to maintenance and repair of machinery.

There are two ways to obtain a spare part to repair a machine that's broken. You can go to the store and buy a new part made by the same manufacturer who made the machine or by a manufacturer who's made an identical replacement part. However, if you can't get a new part, then you've got to find another machine and take the necessary part from it. The latter technique is known as "cannibalization." Sometimes, you're forced to take the part from a perfectly good machine, and therefore you end up having only one operable machine instead of two. The cannibalized machine becomes a "hangar queen" or "junker," which sits around as a source of spare parts, perhaps in the hope that someday you'll find the new parts and be able to put the hangar queen back into operation again.

Organ transplant surgery today is highly perfected cannibalization. An

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operating part—heart, lung, kidney, liver, etc.—is taken from a donor, sometimes recently deceased, sometimes not. The replacement organ is then put into the person needing the new part. This is plain, pure, and simple cannibalization.

And it's necessary because we individually have only one heart and one liver, for example. (We come equipped with redundant parts in the form of kidneys and lungs, however, and we can each function well with one lung or one kidney.)

A quarter of a century ago, organ transplantation was a dangerous and risky thing. The recipient organism tries to reject the interloper. As a result, biotechnologists have performed miracles in terms of disabling the body's Department of Defense and permitting the newcomer and the recipient to become better acquainted. Surgical transplatation of hearts, lungs, kidneys, and livers is now commonplace, albeit expensive, *if* a donor organism can be located in time for cannibalization of the needed part.

This has led medical technologists and surgeons toward the development of mechanical replacement parts which, in essence, allow a person to survive until a donor is located. Some of these techniques and the equipment are very successful. Kidney dialysis can keep a patient alive following renal shutdown, for example. In fact, the whole field of development of artificial replacement parts has progressed to the point where a human being can be kept alive solely by machinery.

However, much of this artificial organ research has been aimed toward the development of a permanently transplantable artificial organ such as the heart.

I seriously doubt that an artificial permanently transplantable heart will ever be perfected.

My reason for believing this has nothing to do with technology. Technically, the permanently transplantable artificial organ such as a heart is feasible. Just keep working on it, and it will come about as a result of ordinary development processes.

But by the time it's available, it may not be needed.

At the rate biotechnologists are forging ahead, surgical organ replacement is suddenly going to go from a cannibalization technology to a replacement technology using new spare parts that have been obtained by cloning.

Personally, I think this is a more acceptable technology. I'd rather have a new heart cloned from my own body cells than to know I was living because I had the heart of a person who could no longer use it.

Cloning clinics and clone crypts will be good businesses to be in at some time early in the twenty-first century . . . or maybe before, depending upon how fast cloning technology progresses. The procedure may go something as follows:

You'll go down to the clone clinic shortly after reaching puberty when your major final growth phase is completed and you are physiologically an adult at the peak of your physical development and condition. Of course, there's a "grandfather clause" in this, too, because those of us who are well past our physical primes at the time clone clinics become available will also

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be able to use them. However, if we old timers need a new heart, we'll probably have to settle for one with imperfections accumulated before we visited the clone clinic. A person who has come in at prime age will be able to get a new heart identical to the one he or she had at age 16, for example. At the clone clinic, technologists will remove microscopic samples of your body tissues as they currently do for a biopsy. They'll then clone replacement organs for you and place them in storage in the clone crypt. Or, if the technology is well enough advanced, they may clone *you* in your entirety, but your clone will basically never be alive and self-aware; it's only a source of spare parts for you when you need them. There's a reason for doing it that way: Why create competition for yourself?

Zeno's definition of a friend will then become a reality. Your best friend will indeed be another you.

When a pair of radio talk show hosts asked me to discuss far-out future technology in an interview promoting my MacMillan book, *The Hopeful Future*, I used the cloning technology solution to the human spare parts problem as an example of some unforecast future technology developments. Friends, if you think that recombinant DNA and genetic engineering are facing more emotional than technical acceptance problems now, wait until clone organ replacement technology becomes reality! The reaction of the talk show hosts and some of the telephone call-ins intimated that I was a ghoul for even thinking about such things. The Frankenstein Syndrome is now deeply embedded in most people's emotional subconscious.

However, from the moral point of view, what's the problem? Today, people are living because transplant technology has cannibalized someone else's body. Is it any worse to cannibalize your own clone for spare parts, especially when you've voluntarily given your own organic material to create that clone with the full foreknowledge that the only purpose and function of that clone is to manufacture a spare part for your body's use at some future date so that you may, by your own knowledgeable actions, prolong your own life? A long and apparently complex sentence, but probably not nearly as complex as some moralists will make the clone transplant acceptance problem.

There's the possibility that cloning technology may suffer the same fate as artificial permanently implantable organ technology: By the time it becomes available for our use, we may not need it. Other biotechnologists may have answered the most basic of all questions: Why we grow old, and why our organs wear out in the first place. An analogous thing has happened in other technologies. Continual improvement in materials, quality control, and design have resulted in many machines that do not wear out, break down, or need repair and/or maintenance as often, if at all. Medical technology may reach the point where every one of us can become a Wonderful One-Hoss Shay that lasts for a hundred years and a day.

Incidentally, this is part of the fun and fascination of technological forecasting. Other technologies don't stand still while one forges ahead. They all move ahead, albeit at different rates. The life's work of a professional in one

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field may become obsolete overnight or become no longer desired or useful because of the life's work of some other professional in what was previously perceived to be a totally unrelated field.

But cloning technology alone offers some fascinating new solutions as well as some frightening potentials. The most obvious misuse of clone technology that immediately comes to mind is the creation of clones to become actual functional human beings. Got the flu today or just don't feel like working? Send your clone to the office! However, it's unlikely that cloning technology will move in that direction. We're already competing with each other, there's a population growth problem that we're finally getting under control, and we don't need fancy cloning technology to make human beings—we already have a way to make new human beings that is well-proven and lots of fun. Why mess with a good thing?

But ready or not, cloning is about to move out of the laboratory and into your life. It won't be very many years before biotechnology cloning experts will be able to create your own best friend. What you do with it is probably going to be up to you . . . if you do it at all in the first place. ■

IN TIMES TO COME

● Our lead story for February comes from the unique imagination of Charles Harness. "The Cajamarca Project" is a project in genetic engineering with an agricultural emphasis—or is it? The client is a decidedly mysterious lady of Incan descent, and the gentleman who has to fill her order finds that the further he gets on the project, the more doubts he has about what she really has in mind. But to give her credit where due, she does think big. . . .

Next month's fact article will probably be a thought-provoking proposal by Duncan Lunan with the mildly enigmatic title "Project Starseed, or, Nuclear Waste Saves the World." Let's leave it at that for now. The one other item I'm sure of is the conclusion of George R. R. Martin's *The Plague Star*—plus, of course, the usual assortment of short stories and perhaps another novelette or two.

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Conquest can be full of sound and fury—or it can be very, very quiet. . . .

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THE SINGING OF THE VESTRY, THE PRAYING FOR THE SKY

Richard M. Shelley

It had been a spaceport at one time.

In a few isolated spots fused silicates could still be seen, remnants of an ancient age when chemical rockets had propelled ships on voyages of decades or centuries. Casual inspection might have missed those spots, even missed the half-buried building's ruins. But beyond all reasonable probability, an ancient landing beacon, powered by the rays of a distant sun, continued to transmit its welcoming signal into space.

After uncounted ages, that signal had been heard—and recognized. A ship at the fringes of the star's system had homed in on the beacon's source, selected one planet from the several it detected, and moved into a complicated survey orbit. Now, a spherical landing craft used the signal to direct its approach. The shuttle's crew could see the overgrown deformity where, according to their orbital survey, artifacts might be found. And, close to those ruins but somehow aloof from decay, stood a wooden tower, topped by the signal beacon.

"Atmosphere?" Issa (Matrix: Szygnit S-7, reinforced) asked as the lander touched down and levelled itself.

Eron (Matrix: Cowlieze D-4), Issa's mission specialist, read the numbers from the analysis and added, "pretty standard and a lot cleaner than the air back home."

"Aren't they all. Let me know when the microorganism report's ready." Issa kept her voice level, holding back the excitement she had felt since the discovery of the signal beacon days earlier.

"Coming through now." Eron tried to match his commander's calm, but with indifferent success.

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The lander had been on the surface a half hour before the crew opened a hatch and lowered a ladder to the ground.

"Nothing but good, clean air," Eron commented as he took his first breath of the planet's atmosphere. By the reverse protocol of the Service, he had to be first out of any vehicle, as junior officer. Issa followed him down the ladder and out from under the lander's shadow.

"Not much left," Issa said, pointing to the ruins. Her voice almost cracked on the expression. An occasional glint of metal or glass poked through the underbrush. There was rarely anything at all on the surface, and the bits and pieces dredged up in core samples were never exciting. After nearly two million years, one could hardly expect to find much unless a colony had prospered for a great many generations. Even then, the planet had to remain physically stable through the millenia. Planets that met both criteria were rare. The first wave of pioneers had been adventurous. They had settled, rested for a year or a generation, and then moved on, looking for Eden and other intelligent races. They had been lonely people, even when they voyaged with thousands of other humans.

"I don't get it," Eron said. "How can the tower still look new? How can the beacon be working? It doesn't look like anyone's been here in ages."

"Darn, I left my crystal ball in my other uniform."

Eron ignored the sarcasm. "Do we take samples here first or move right to the town?"

"Let's go to town." Enthusiasm finally got the best of Issa. Standard procedure would call for taking core samples of the ruins and making extensive examinations of the tower and beacon. But there was an entire *town* not far away. Maybe—a delicious maybe—there were still people on this planet.

"Give me a minute. I want to check out that beacon."

"Be careful," Issa said, automatically. "And make it quick."

The tower presented no difficulties. Eron tugged on several of the beams. Nothing moved, so he started to climb, slowly at first, more rapidly as he gained confidence in the wood's integrity. The tower was as easy to climb as a ladder. Thirty meters up, Eron wrapped a leg around an upright and hooked his foot behind a crosstie to anchor himself. The beacon was housed in a small canister, flanked by four solar collection panels. The canister was slick and dark, showing no hint of aging. Although Eron's earlier instrument check had assured him that there was no power leakage, Eron didn't bother opening the cylinder. He saw enough on the outside. For the moment.

"Well?" Issa asked when Eron climbed back down.

"There's an inscription," he said, looking up at the canister. "It says, 'L-5 Industries, Inc., SN 1731.' "

"You must be kidding. Original equipment?"

"The housing at least. That thing was made in the Solar System more than two million years ago."

"How far away is this town?" Eron asked.

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"Five point one kilometers from the tower."

"So, why don't we just take the lander and set down a little closer to the town? Save ourselves a long walk, and so forth."

"By the book, Golden Boy, by the book."

Eron chuckled. "You're still jealous," he said. The creamy gold complexion that dominated the generations of the Cowlieze matrix was the envy of many duskier matrices.

"We walk," Issa said.

"Who's going to know? You can bet that the comedians who wrote that precious book never hiked five klicks with full packs."

"Quit griping and let's get started."

At the boundary of the spaceport they had to cut through a thick tangle of vines and thorn bushes. Once past that obstacle, they faced open terrain. Trees, vines, and thickets clustered in isolated patches, islands punctuating the incredible expanses of thick prairie grasses and wild flowers.

"Is that hedge as weird as I think it is?" Eron asked as he slung his pack over his shoulders and adjusted the straps.

"Probably. Just keep your camera rolling. Let the brain boys argue about the hedge when we get home."

"You think I'd forget my camera?" Eron demanded with as much indignation as he could muster. A triple-lensed video camera was attached to an epaulet on his fatigues.

"When you start crabbing, I don't know what the hell you might do."

Eron adjusted his equipment, trying to think of a suitably crazy reply. Creative impulses failed, so all he said was, "The sooner we get started, the sooner we'll get there," and he quickly wished he hadn't said that.

"How did anyone as lazy as you ever decide on a career in the Survey Service anyhow?" Issa asked, suppressing a laugh.

"Lazy? Lazy? Just what do you want out of me? After weeks of keeping you happy on the ship, a few days of this is almost a vacation. You think 'Lady and the Pirate' is easy to play with a straight face?"

They followed what might have been a road when the spaceport was in use. Neither Eron nor Issa was in a hurry. Dusk was more than seven hours away. They planned to spend at least three of the planet's 21-hour days on the surface, more if needed.

They walked. They rested. They took time to smell the flowers, to observe and record the planet's flora. They took samples, ranging from cut flowers to tree seedlings. Neither of the explorers had any special training in botany. The specimens they gathered might be derived from Earth, from earlier stops on the odyssey of the original colonists, or they might be native, or even crosses among plants of varying origins. Neither Eron nor Issa cared about such details, but the botanists who would examine their tapes and samples would care, and they might even be able to tell. They would grow plants from the samples. The body of human knowledge would grow. For the explorers, it was enough that there were blooming flowers and green trees.

The planet was alive. Besides the

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variety of plant life, there were animals. Birds of many varieties flew from tree to tree. Some sported brilliant plumage. Others sang songs. None seemed to take much notice of the intruders. On the ground, there were squirrels and cats, and hidden movement that might signal the presence of other animals.

Issa and Eron stopped for lunch next to a small brook. They took their time, resting in the shade of a large tree. Issa had finally decided that it was time to move on when she saw the first animal that she thought might not derive from Earth. The creature was about 80 centimeters long, with reddish-brown fur. It had an expressive, slightly anthropoid face and head. "A primate," Issa decided, "something like a cross between a monkey and a teddy bear—opposable thumbs; no tail; tiny, flat ears."

The primate came to within three meters of the strangers, stopped, and examined them, lifting on its hind legs for a moment. Its mouth worked, but no sound emerged. Then it dropped back to all fours and scurried away, disappearing in the tall grass.

From the top of a gentle rise, Issa and Eron could look down into a depression that held what remained of the town they had detected from orbit. Grass had grown in, or through, the streets. Vines had established themselves along the perimeter, and there were a few areas of brush, but the town had less of the wild look than the spaceport's perimeter had.

The photographs taken from orbit should have prepared the explorers for the vista, but it hadn't. Issa gasped. She scarcely dared to breathe, afraid that the vision would disappear. Eron had to restrain himself. He felt an overpowering urge to run down the slope through the streets of the town. No survey team had ever discovered anything to compare with this.

The town was entirely contained in the bowl-shaped valley, laid out in three concentric circles around a single building that had been set off in the center. The outermost circle had been reduced to scrap lumber, much of it buried in underbrush like the spaceport terminal, but it was lumber, and it was visible. Issa realized that she had been holding her breath and took in a deep lungful of air. There was even more. The middle circle had a few buildings still standing. And the inner circle was nearly intact; only a few of its score of buildings had collapsed. Finally, the central building looked as though it needed nothing more than a fresh coat of paint.

"I saw some movement." Eron gestured vaguely toward the center of town. "Something small. Maybe a cat."

Issa nodded. Man might have conquered the stars, but never alone. The early colony ships had all carried livestock and pets. By the time colonists moved to the next planet, there were often more animals than they could take. Finding feral cats or dogs was encouraging. If there were none, the suspicion remained that the colony had fallen on desperate times. Issa shuddered, remembering the one nightmare planet she and Eron had surveyed. Iceberg was considerably smaller than Earth, with a thin atmosphere that merely hovered at the edge of breathability. But men had landed and established a primitive settlement. They had built stone huts,

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half sunken into permafrost. The stone survived, but none of the colonists or their animals. The colony's end was easy to reconstruct. In a shallow pit behind a row of stone huts, Issa and Eron had found the frozen and partially eaten bodies of the last colonists. The teeth marks were human. Those corpses had haunted Issa's dreams for weeks.

"It's a church."

Issa bent closer to the stone slab next to the door. The rock had weathered, but the carving had been deep and true.

SAINT IGNATIUS
The Church
Our First Building
Our Only Hope

"Their first building?" Eron said, astonished.

"That's what it says. Maybe this isn't the original building though. The stone could be older."

Eron traced the letters. "Airenglish."

Issa nodded.

In the narrow span of time between man's discovery that pilots and ground control needed a common language and the complete automation of flight, Airenglish had become the professional language of fliers and pioneer spacemen. It had been standard at the time of the first colony ships. Outside the clannish confines of the Survey Service, Airenglish had been dead for hundreds of millenia.

Eron said, "Anyway, we've got a name for the planet."

"I guess," Issa agreed.

The church of St. Ignatius was a simple wooden building, fairly small. Only the large wooden cross in the sanctuary confirmed the building's religious nature. Two smaller rooms—vestry and parish office, perhaps—bordered the sanctuary, giving the church a roughly cruciform shape.

"I can almost smell freshly-cut lumber," Eron commented.

"No sign of water damage, no dust even." Issa walked around the church, opening doors. Shutters covered glassless windows, but some light came in through small openings at the tops of the walls, under the eaves.

"At least we don't have to sleep in a tent," Eron said, "unless that famous book has a rule against being comfortable once in a while."

"Only if the owners ask us to leave."

"You don't really think anyone lives here, do you?"

Issa shook her head, but it was a very tentative gesture. "Still," she started, leaving the word hanging for a moment, "that signal beacon bothers me. And I can't believe two-million-year-old wood that still smells like it's just been cut."

Eron knelt to feel the floor. "Too smooth to be new. A lot of feet, a lot of years. And look, wood pegs instead of nails. Must be original. If the colonists had rebuilt after they'd been here awhile, don't you think they'd have used something more permanent?"

"More permanent?" Issa asked through a laugh. "If you don't consider two million years permanent!" She laughed again.

Eron stood and looked around the bare church. "Don't you think this would be a terrific place for a little vacation? Say, a week or two?"

"We'll see," Issa replied. "Maybe we need reservations."

"Nice place, nice weather. I'll see

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if I can open a couple of shutters. Let some light in." The shutters opened too easily. "Somebody must keep the hinges oiled," Eron said, a little uneasily.

"I wonder how cold it gets at night." Coming from a planet that had flirted with its thermal limit too long, the Earthborn found cold hard to handle. For two million years the human body had been developing ways of dissipating heat efficiently, stretching to present more surface area, slowing down and speeding up various functions. Now, most of the galaxy's planets felt too cold.

"Shouldn't be bad, Issa. Short night. Besides, it's spring."

"I hope you're right. We can't very well build a fire in the middle of the floor."

"Don't worry, Issa, I won't let you get cold."

"I'm not sure I want to do *that* in a church, either."

"If you're that superstitious, we could try one of the other buildings. There must be a dozen as well-preserved as this one."

"I'll think about it."

Eron collected dead wood and built a fire next to the dedication stone. He and Issa warmed their rations and ate, watching daylight dwindle and disappear. The night of St. Ignatius started peacefully. A few night birds sang. Animals scuttled through the underbrush. One of St. Ignatius's two moons made its way overhead. Before the fire died out, Eron and Issa went in to bed in the church vestry.

Issa came awake suddenly. She lay awake, listening, trying to place the sound that had wakened her. Eron was still asleep, breathing quietly. That wasn't it. After their years together, his breathing was a normal night sound. Issa closed her eyes and slowed her own breathing, clearing her senses, reaching into the haze just before she woke.

Singing. The noise had sounded like faint singing. As Issa started to slip back into sleep, the song echoed through her mind. "*Gloria, in excelsis Deo . . .*" The words to the hymn tumbled out of her memory. It had been years since she had heard or sung the "*Gloria.*" The last time had been on an Easter morning, when she was twelve. The next day, her parents told her they were getting a divorce. They had been separated for weeks but had concealed that fact from her. "Daddy" was just on a long business trip. But on Easter Monday, he had come to pack the rest of his things. He was supposed to be gone before Issa got home, but school had been dismissed early. Her parents had little choice. They told her about the divorce. After that, Issa had seen little point in going to church.

The second time Issa woke, she shook Eron awake. "I heard something," she whispered.

Eron fumbled in the dark until he found a lantern. He held the control until the light was as its brightest. "What was it?"

"I'm not sure. It sounded like distant singing."

Eron held back a sarcastic remark and said, "I'll have a look."

"We both will." They dressed and each took a lantern. They looked through the church and then circled the building,

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flashing their lights toward the outer circles of the town. A cat raced away. Other animals could be heard in the darkness.

"Now what?" Eron asked when they had finished. He kept his voice level. A needless alert was infinitely preferable to missing a real threat.

"Maybe it was just a dream," Issa said, but she didn't believe it. "Maybe I'm just too keyed up. Let's get back to sleep."

But Issa slept very little the rest of the night. As she started to doze, she would see a devilish-looking cat. Somehow the cat acquired priestly vestments. When the animal started to sing hymns, Issa woke with a start. The last two hours of darkness seemed eternal.

There was a slight chill to the air when Issa quit trying to sleep. She was thinking about getting up to start a fire for coffee. She was awake and alert.

Oh come, oh come, Emmanuel,
And ransom captive Israel,
That mourns in lonely exile here . . .

The singing was faint and high-pitched, at the threshhold of Issa's hearing, but it was definitely singing. "Unless I'm losing my mind," she thought. While she dressed, Issa felt her body reacting to fear, goose flesh and an almost sexual rush. When she left the vestry, she was holding her pistol. Issa tiptoed silently through the nave, relying on the faint glow of morning twilight. But the singing had stopped.

Issa stood rigidly still, just inside the main entrance. She reached out to open the door but pulled her hand back. She scarcely breathed, waiting for the singing to resume. The church got lighter with the dawn. Birds started to chirp their own songs, loud, safe songs. but they weren't the choir Issa had heard in the night.

"What're you doing out here?"

"I heard singing again. No doubt this time."

"You should've woken me. Especially if you thought you needed that." Eron pointed to the gun in Issa's hand.

She stuck the weapon in her pocket. "No, it's just that this damn church has me spooked."

Eron could understand that. After three years of traveling together, there was very little they didn't know about each other's history.

"Then let's sleep in one of the other buildings tonight."

"No. I'm not going to fall apart just because of a little noise in the dark. I'll be fine when we find out what's making the noise. I heard something, and it sounded like singing."

"Okay. We'll find it."

Issa nodded. "About ready for breakfast?"

"Always. I'll get the food."

"I'll start the fire." Eron had stacked extra firewood outside. Issa would only need a moment to kindle a fire. A glancing shot from her pistol would start a log nicely. She opened the door.

The wood was gone. Even the ashes of their evening fire were gone. When Eron returned with their food packets, Issa just pointed.

"Looks like the janitor's been around," he said. While he joked, Eron's mind raced along a tenuous path of logic. "Cats don't carry off wood," he mumbled, "and they certainly don't sweep up ashes."

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After breakfast, Eron clipped his camera to his shoulder and slipped a clear contact lens over his left eye. The lens was a monitor for the camera. As long as the eye was open, there would be no interference with normal vision. When Eron closed the eye, he would see whatever the camera saw, in ultraviolet and infrared as well as "visible" light.

"I'll go in alone," he suggested. "You stay outside and make sure the locals aren't playing musical chairs with us."

Issa replied, "Keep in touch." Both slipped radios into their ears.

"I wish the lander were here," Eron said as they crossed to the inner circle. "We could set up a dozen cameras and watch most of the town."

"If this search doesn't turn up answers, we can bring it over," Issa agreed. "But one of us will have to hike back to get it. I didn't set the controls for remote."

"Meaning me," Eron said. Issa smiled and agreed.

The search was thorough, uncomplicated, and unproductive. Eron went through each building. A few of them sheltered small animals, as did many of the ruins.

"Nothing bigger than a hefty housecat," Eron reported after two hours. "Not even one of the primates."

"I guess it's time for the shuttle. I'll mark a landing zone."

Unburdened by his pack, not stopping along the way, Eron covered the five kilometers in thirty minutes, alternating his pace between a brisk walk and a slow trot, working up just enough sweat to let him know his body was still functioning. He walked the last couple of hundred meters, catching his breath and scanning the hedge for the gap he and Issa had cut the day before.

"It's got to be here, somewhere," he mumbled as he reached the hedge. He looked at the tower, the ruins, and the lander. "Right here."

But there was no sign of the meter-wide gash. Eron looked closer and finally found the spot. Branches had been woven across the gap and new plants installed. Annoyed, Eron pushed his way through, uprooting the transplants. And then he got his second surprise. Young vines were gripping the skids of the lander. The vines weren't strong enough to hold the shuttle, but Eron took out his pistol and burned them away from all three skids. When he finished, his hand was shaking.

"Damn," he muttered, staring at his hands, "she's got me spooked too."

The shuttle's hatch opened to the proper code. The interior showed no sign of trespass. Control readings were normal. Liftoff was smooth. Five kilometers, in a vessel capable of 200,000 kilometers per second, isn't even a jaunt. Up, over, down.

Issa ran to meet him. "What kept you? Forget which way's up?"

When he explained, Issa lost her smile. "What the hell's going on?"

"I was hoping you'd have it figured out. All this time we've been chasing around the Galaxy looking for people or aliens, and all of a sudden I'm not sure I want to find them."

They spent the rest of the daylight

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hours arranging their surveillance equipment. Every sight and sound, around the church and out to the first ring of buildings, would be monitored.

"You know, Issa, I just realized something." They were sitting by their fire, watching their second sunset on St. Ignatius. "All of the intact buildings were put together with wood pegs, like the church. The ruins had nails, or at least a lot of rust stains."

"Some wood."

"Strange. When I was a kid, my folks had a cabin by a little lake."

"So what's rich folks doing in the Service?" It was an old joke.

"It's really not that funny," Eron said this time. "Dad went broke trying to keep it up. Every year we went to the lake for a month's vacation. Dad always spent the first week or so repairing the cabin and our fishing dock. He'd fix shutters, replace rotten boards, all that kind of stuff. The last time I saw the cabin, just before we lost it, the place was falling apart. It was less than 30 years old. And this wood is ancient."

"We've got samples. Let the experts worry about it. Go get some sleep, I'll take the first watch."

Issa sat in the church doorway. The fire was in front of her, much larger than needed for warmth or cooking, even larger than needed to remind her that she wasn't on Earth where even church candles were strictly regulated and rationed. The surveillance monitors were just inside the church door, at Issa's left.

For the first time in her career, Issa was up against something that didn't fit into neat, predictable categories. Even Iceberg, with its corpses and killing cold, hadn't been this unnerving. Strangely enough, being alone was the most insistent of her fears. It was ridiculous, and Issa realized that. As a cadet at the Academy she had spent an entire summer undergoing an isolation test. Instead of the mandatory 10 days, she had volunteered to try three months in a room the size of a lander cabin and less comfortable.

Next to the door of the isolation chamber there had been a panic button, bright red and clearly labeled in both the Airenglish that members and cadets of the Survey Service affected and in the Mezzoamerican they had spoken as civilians. All Issa—or any cadet—had to do was hit that button and the isolation would end within seconds. Some students reported that it was the panic button that made their isolation unbearable. "That button was just always *there*, mocking me, daring me to push it." Issa had never pushed the panic button. The test hadn't even been a challenge for her. There were few enough places on Earth where a person could be alone for any length of time, and Issa had preferred solitude from the time her mother kicked her father out.

Now, Issa was afraid of being alone, even though Eron was only a few meters away. Finally, it was time to wake him and force herself to sleep. Slowly, almost painfully, Issa pushed her worries aside and struggled for the security of sleep.

Eron's watch passed peacefully. From time to time he walked around the church and looked out at the rest of the town. St. Ignatius was quiet. Just before

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the end of his shift, Eron stood and stretched, ready to make one more circuit before he woke Issa. A blinking blue light on a monitor panel caught his attention. One of the microphones was picking up a new sound. Eron switched the proper link to his earphone. He didn't hear anything, so he adjusted volume and pitch until the sound was audible.

Abide with me,
Fast falls the eventide,
The darkness deepens . . .

As more microphones picked up the singing, the instruments gave conflicting evidence on its point of origin. The song seemed to come from all around the perimeter, but it was also coming from the church vestry, where Issa was sleeping. Eron whistled a warning as he ran toward the sleeping room.

"Did you hear it?" he called.

"Just for a second."

"Part of it came from in here."

"Impossible."

"Afraid not."

The instruments indicated more activity when the explorers scanned them together. The singing was gone, but the most distant microphones registered the sounds of moving feet, hundreds, thousands of them, out in the darkness, out of range of even the infrared camera lenses. For an hour, the animals continued to enter and surround the town and church of St. Ignatius. They stayed out of view of cameras and eyes, but the explorers knew they were there.

Shall we gather by the river,
The beautiful, the beautiful river . . .

It was nearly dawn. The last hours of night had been filled with the sounds of marching feet and with infrequent bursts of song, but the hordes of animals had remained hidden.

"What do we do?" Eron asked.

"As soon as it's light, we go looking," Issa replied. "We've got to find out what's out there."

"There's a river just the other side of town," Eron said, thinking of the latest hymn. "Or," he suggested slowly, "we could just go back to the lander and get the hell out of here while we can. We know somebody—or something—lives here. That should be enough to keep everyone happy back home. They can send out a full expedition."

"We found a planet that showed strong, irrefutable evidence of prior human occupation. During three days on the surface—spent, mind you, in an incredibly well-preserved, *wooden,* town, we heard hymn singing on several occasions—in Airenglish and in Latin —even inside the building we were using as a command post, but we were unable to locate or identify the singers." Issa turned squarely to Eron. "Can you see us standing in the Commodore's office trying to sell him a report like that?"

"At least he'd have a report, Issa, not just two more missing scouts. We've found something really important. Isn't getting that news home more important than maybe looking a little foolish? I'd feel worse if we let a mob of cats and monkeys kill us."

"We're not missing yet. Nobody's made a threatening move. There's no 'clear and imminent danger.' We planned to stay three days. We've still got one day left. At least."

"You're the boss," Eron conceded,

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"but if we get killed, I'm going to haunt you for eternity."

Issa smiled despite her nervousness. "So what else is new?"

St. Ignatius quieted as its sun rose. The singing stopped. Even the drone of marching feet ended. Issa walked out into the street. Dawn on an alien planet was usually special for her. She normally reveled in her thoughts during those moments, glorying at a sunrise men might not have seen in a million years or more. Even on Iceberg, dawn had been special. But St. Ignatius was different. Its night chill had touched her spirit.

"Better eat," Eron said, breaking into Issa's thoughts. "It's hot and waiting."

They ate in silence. Issa had to force each bite. Eron ate absently, watching Issa. Her malaise was obvious. For the first time in their years together, Eron was aware of the differences in age and experience between them. They had met after Issa returned from her first scouting expedition. She was teaching at the Academy during the year of Earth duty the Service required between missions. Eron had asked a lot of questions, still full of student enthusiasm. Their talks continued after class. They became friends. They became lovers. After Eron's graduation, it was natural for them to team up for this mission. The balance between authority and affection came naturally to them.

"Let's get busy," Issa said when she had eaten all she could.

"Start with the river?" Issa nodded. "Off that way," Eron said, pointing.

From the top of the hill, Issa and Eron could see the river, a narrow stream that wandered generally northwest. A prominent bight reached toward the town. The river had pinched off an area of about 1000 square meters. This peninsula was dominated by one ancient tree which was bent and twisted in a tortuously arthritic fashion. Its bark was wrinkled and scarred. Dead branches hung at awkward angles, broken in repeated frays with nature. But it lived. New branches had emerged, some growing out of old fractures. Spring had turned the tree green, and small purple blossoms were opening. Younger trees of the same sort ringed their senior, as the buildings of St. Ignatius ringed its church.

"Look, in the branches," Issa whispered as they neared the river.

The monkey-like primates seemed to crowd the branches of every tree on the peninsula. There were hundreds, mostly concealed by the spring foliage. They watched the humans. Eron and Issa watched back.

Five smooth stones formed a convenient causeway to the peninsula. Eron and Issa exchanged glances and Eron led the way across. Once the explorers entered the grove, the animals all seemed to come to wary attention. Their eyes followed every step, every motion the strangers made. Issa stared back, following Eron almost blindly until he stopped suddenly and they nearly collided.

"Look," was all he said. At the base of the ancient tree in the center of the grove was a stone monument topped by a large cross. The carving on the face of the monument had been nearly erased

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by time. Eron read the inscription as much with his fingers as his eyes.

Father Dominic Francis Eberhart
Born 122491 A.D., Skaggerath
Died 122570 A.D., St. Ignatius
Our priest and confessor sleeps here
To wait for the return of our Lord

"That gives us some idea when the planet was settled," Eron said.

"That last date would be, what —120,370 A.A.?"

"Yeah," Eron replied after a quick calculation. "They must have left Earth in one of the first ships, before they changed the calendar." He brushed off his hands. "I wonder where they buried the rest."

"Maybe he was the only one. The only one with a headstone, anyway."

"They were here a long time. The different stages of building show that." Then he whispered, "Want to try to get one of these primates?"

Issa looked up at them. The animals were still watching.

"I don't think so. Let's check on the lander. We can worry about what else we're going to do later. Go back across the river, I'll join you in a minute."

"Sure?"

"Just go. I won't be long." Issa watched Eron hop from stone to stone across the stream. She waited until he reached the far bank, then turned back to the ancient tree. One of the primates was within 50 centimeters of her head.

"I don't know if you can really understand me," Issa whispered, meeting the animal's gaze, "but we're just curious. We're looking for the people from Earth, people like us, who used to live here. They've been lost for an incredibly long time. If you can help us, we'd be very grateful." Issa waited for a moment, then turned and followed after Eron. No voice called to her. No singing accompanied her departure.

"The gardeners have been working again," Eron said. They had walked around the town to their lander. The shuttle's skids were all hooked to the ground by wiry green tendrils that hadn't been there a day before.

"Let's cut them loose," Issa said.

While they were working, the animals came. Softer than the faint buzzing of the pistols, the animals came from every direction. Cats, rats, squirrels, and the primates gathered and marched toward the lander in almost military precision. Songbirds followed, swooping in from distant nests, settling in nearby trees and on the lander itself. Eron and Issa worked on for several minutes before they noticed that they had drawn an audience. A breathing carpet of fur surrounded them and stretched for nearly a hundred meters. Only a ten or twelve meter radius around the lander was clear.

"Would you call this a 'clear and imminent danger?' " Eron asked softly.

"Walk to me, slowly," Issa said.

"Now hand me your gun." Issa took the weapon in her left hand. Her own pistol was in her right hand, pointed loosely toward the ground.

"Don't make any sudden moves, but edge toward the hatch. See if you can open it. Get in, grab two more guns, and cover me. I'll be right behind you. I may be moving fast, so give me as much room as you can."

Eron kept his eyes on the front ranks of animals as he moved toward the

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hatch. Retreat. The word caught in his mind. They were running from a mass of animals. Except for the primates, none massed more than five kilos. Even the monkeys had to be less than twenty kilos.

The hatch was six steps away, then five. Eron turned to scan the circle of animals. Every one seemed to be staring back, poised to spring. Eron thought about being buried under a pile of animals so thick that he wouldn't be able to move or breathe. The image of suffocating in fur paralyzed him for long seconds.

Four steps from the hatch, he paused again, wishing he could get inside the animals' heads, wishing he knew what the animals would do. He managed two more hesitant steps, listening for any warning that the animals might be ready to attack. Issa backed one step toward Eron. Her movement seemed to signal the animals. Their quiet circle moved. Without haste, the ring contracted, coming to within a couple of meters of the explorers. At the same time, a path opened up through the circle, a narrow wedge leading back toward the town.

"I think they want us to go back," Issa said. She edged another step toward Eron. The animals also moved closer. The pathway remained, a straight line leading back toward town.

"I don't think we've got much choice," Issa added. "Two guns wouldn't begin to make a dent in this mob."

"Don't be too hasty. We may never get this close again."

"Try one more step."

Eron took the step. The animals took several. The circle almost touched the lander.

"Don't," Issa said, when Eron started to take another step. "Let's go back and see what they want."

The animals kept Eron and Issa company until the explorers were back inside the church. Then the creatures formed a cordon around the building. Every rooftop in the inner circle of St. Ignatius was lined with birds and primates. Cats patrolled the street. Rats vanished into burrows and crevices, watching from the dark. Squirrels sat in the open street, watching the church's doors and windows with unblinking eyes. One by one, the cameras went blind and the microphones deaf, except for the instruments mounted on and in the church itself.

Eron closed the door and walked into the center of the church. "We're prisoners," he announced. He started shivering and sat on the floor. "This can't be happening," he cried in a moment of desperation.

Issa knelt at his side. "It is happening," she said, gently, because his distress was both obvious and familiar. "So, what we have to do is find a way out."

"How?" Eron closed his eyes and fought to control his sudden fear.

"We've got possibilities. We just need to find one that works. We've got one lander here and two more we can bring down from the ship. We've got our guns. And our brains."

Eron breathed deeply several times and finished his conditioning exercises. When he spoke, his voice was calm.

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"It might help if we could communicate with them."

"Then find a way. You're the comm expert."

"Whom do I talk to? The primates? How about the cats? Maybe even those ugly black rats. We don't know who's running the zoo. There may be people out there, somewhere, controlling the animals. Maybe even something we wouldn't recognize if it ate us."

Issa stared at Eron for a moment, but the panic was gone from his eyes as well as from his voice. She stood and looked at the door, then crossed and opened it. The animals were still there, still watching.

"We want to talk to your leader," she called out. "What do you want with us? Why don't you want us to leave?"

There was no answer, no sign that any of the creatures understood, or even heard—except, perhaps, that the eyes of the closer animals seemed to contract. Issa looked at the sky. There were several hours of daylight left. *I want out before dark,* she thought, but no magic solution occured to her.

"I don't think we've got enough wood to last the night," she said, closing the door and turning back to her partner.

"We could always burn one of the buildings," Eron suggested.

After a long hesitation, Issa said, "Maybe you've got something. Animals are supposed to be afraid of fire, aren't they?"

"I guess."

"We could fire the whole town, if we had to," Issa said, thinking while she spoke, "and have a lander set down outside the door. It just might work."

"And if it doesn't, we're really in one hell of a spot."

"I didn't say it was perfect." Issa shrugged. "We'll save that for a last resort. Try to come up with something better. But in the meantime, set up a second lander. Better use the digger. It's got the closest thing we've got to armor or heavy weapons. Program it to set down right outside the door, hatch facing us, say, a half hour before sunset. Use the first lander as a decoy. Move it around. Make them think we're going to try for it."

Eron used the control equipment they had brought from their lander the day before. Maybe it would work, he thought. Even if it didn't, anything was better than waiting for the animals to get hungry. Eron was keying the instructions to the ship when the singing started again.

Onward, Christian soldiers,
Marching as to war . . .

"Keep working," Issa ordered. Eron hadn't stopped. This singing was clearly audible without artificial amplification. Thousands of high-pitched, tinny voices were united in a painful chorus.

Without interrupting his work, Eron said, "Some of that's coming from inside the church. The vestry again."

Issa went to look. "Must be termites," she said when she returned, but there was no humor in her voice.

Eron finished his work. "Thirty minutes before sunset," he reported.

"Good. Ten minutes before that, we start setting fires unless we've managed—" Issa didn't finish her sentence. The song outside had changed.

O come, all ye faithful,
Joyful and triumphant . . .

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Then the walls echoed with the sounds of small objects hitting them.

"I think we're being paged," Eron said, drily.

Both explorers checked their guns and slipped them back into their pockets. Issa opened the door slowly. The hail of pebbles stopped.

A fresh pile of firewood had been assembled next to the door.

Eron's gaze went from the wood to a spot about ten meters from the door. The sod had been cleared and soil smoothed. A large valentine heart had been sketched in the dirt. A cross decorated its center.

"They understand us," Issa commented.

"Even what we say inside," Eron pointed out carefully. Issa nodded.

O come let us adore Him,

O come let us adore Him . . .

The animals framed a pathway leading toward the river and peninsula. They watched the strangers while they sang. The hymn ended, and was immediately followed by another.

Shall we gather by the river,

The beautiful, the beautiful river . . .

Issa nodded and the singing stopped.

"I think they want to reassure us," Eron admitted grudgingly.

"Walk into my parlor," Issa whispered.

The route was lined by the animals of St. Ignatius. Eron followed Issa over the ridge and down to the river, from stone to stone as they crossed to the peninsula. While he walked, Eron glanced up at the sky, trying to gauge how much time they had until the first shuttle started hopping up and down and the second arrived. About an hour and a half, he guessed, but he wasn't sure.

Tens of thousands of the smaller animals lined the river bank after the explorers crossed. They were silent and orderly, watching patiently.

"I wish someone would talk to us," Issa said, looking at the primates in the tree over the tombstone. "We know you sing. Can't you talk to us?"

A primate came down and sat on top of the stone cross. Issa watched its mouth move, but she heard nothing. Then the creature lifted its head and "spoke" silently to the other primates. After a few minutes, the furry creature turned to Issa again. The mouth moved silently. Then the primate seemed to repeat the phrase in unison with the other animals in the grove. The result was a loud, ragged whisper.

"And the angel of the Lord said, fear not, for thou art blessed among women."

"I am Issa. My companion is Eron. We are from Earth." Issa spoke in a normal voice, but the animal just in front of her squinted his eyes as though he were in pain.

"The Lord be with you."

"We're looking for people from Earth who came here nearly two million of our years ago." Issa lowered her voice, but the animal still seemed to suffer some distress.

"In the beginning was the Word, and the Word was made Man."

"Where did they go? When?" Issa was whispering now, speaking so softly that Eron had to concentrate to understand. The primates seemed to have no difficulty hearing her though.

"Lo, I am with you always, even unto the end of the Earth."

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"Issa," Eron whispered, "I'm getting a peculiar feeling about this."

"They just speak so softly that we can't hear one or two," Issa said. "Their hearing range must just barely overlap ours. They use numbers as an amplifier."

"Obviously. But that's not what I'm talking about."

"What, then?"

"Issa, we've found the people from Earth."

Hallelujah!!

Issa sat down hard. In the silence that followed, another primate came down from the highest branches of the tree. It moved softly, using only three limbs to climb. The fourth clutched a small, cloth-wrapped bundle. The primate came out of the tree and walked up to Issa, very cautiously. This creature that was —somehow—human laid the bundle down and carefully unfolded the cloth, showing Issa a baby. The infant, no more than twenty centimeters long, still hairless and helpless, looked like a miniature human baby, or a child's doll.

Since it was apparently expected, Issa made a fuss over the infant, just as she would have over a friend's baby. After a few moments, the mother wrapped up her infant and retreated into the tree.

Abide with me,

Fast falls the eventide . . .

Issa looked to the sky. Sunset was barely an hour away. The landers would be going into action soon. "Of course we'll stay for awhile," Issa said, "now that we know. There's so much we want to learn about you."

"Ask and it shall be given."

They returned to the church in time to cancel the lander movements. A fire had been lit, outside the church, where their own fires had been built. Water was boiling in their coffee pot.

"So much for the afraid of fire theory," Issa mumbled. She went inside to get their evening rations. When she and Eron started to eat, the animals disappeared.

There was too much to say, too much to think. Supper gave the explorers a chance to recover. Hands and arms mechanically conveyed proper portions of food from mess kits to mouths. Eron and Issa might almost have been animated figures in a diorama, "Camping Out," in a recreational museum. The sun set. Stars began to appear. When the silence finally ended, it was to simultaneous questions.

Issa asked, "How?" Eron asked, "Why?"

"I always thought evolution meant improvement," Eron said later.

"For St. Ignatius, maybe it was improvement."

"Going backward?"

"We don't know what they faced. We haven't seen anything bigger," Issa pointed out. "Maybe they had to get smaller and hairier."

"Maybe. They've sure got an eerie way of talking."

"You're missing something."

"What?"

"Did they say one word you didn't recognize?"

"No," Eron admitted, "but what has that got to do with anything? All they were doing was reciting from the Bible and singing hymns."

"In perfect Airenglish, better than we speak it maybe."

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"Speak for yourself," Eron said absently. His mind had drifted back to freshman classes in language and communications theory. "Did you notice the way they stare when they speak, or listen?"

"How could I help it?"

"I don't think they depend on hearing to communicate. Their leader always moved his hands and face when he talked."

"Sign language?"

"Sign language, body language, whatever."

"That's got holes in it a kilometer wide."

"Give me time, I'll figure it out."

After another long silence, Eron said, "It looks like the grand search is finally over."

"Not nearly. We found one bunch. There may be hundreds, thousands, of other planets with people on them. Some should still be people." After a pause, she switched to Mezzoamerican and added, "But I'm done. I've had it."

Eron nodded. "I'll be content to find something peaceful," he replied in the same language. "Spend some time on Earth, just to remind myself what it's like, then go out to one of the colonies not too far from home."

"Sounds wonderful. Got room for me?"

"Always."

It was the first conversation they had ever had in their native language when there weren't outsiders taking part. Without any more being said, they realized that they had already started to cut themselves free of the Survey Service. They went to bed when there was nothing left that either wanted to say or think. Issa went first, struggling to calm herself. They had found descendants of an early colony. When they got home, if they got home, there would be fame, lectures, probably a year teaching at the Academy. And there would be money. But Issa couldn't bring herself to think about the money yet, not while she was still on St. Ignatius.

Eron thought about the money. He had grown up watching his father work himself to death for the simple luxury of a vacation home on a restricted lake. The chance for independent wealth had drawn Eron into the Service. One hundred and twenty years earlier, when the first search mission was launched, a fund had been established to reward the crews that first returned with news of a surviving colony from the first stellar diaspora, and first word of contact with intelligent aliens. With faster-than-light travel finally a reality, the consensus had been that both prizes would be claimed quickly.

After 120 years of subscription and compound interest, the trust was easily the largest in the Solar System.

"These creatures will make me one of the thousand wealthiest people back home," Eron reminded himself. But there was also a chance that his name would be added to another select list, the roster of men and women presumed, or known, lost on scouting missions. Eron finally joined Issa in the vestry and went to bed. They slept, because they needed sleep, because their bodies demanded time to recover from the strains and stresses of the day. Their fire burned out while a choir of St. Ignatians serenaded them.

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Silent night! Holy night!
All is calm, all is bright . . .
Apart from the chorus, St. Ignatius remained quiet through the darkness.

Now the shades of night are gone,
Now the morning light is come.
Lord, may we be Thine today;
Drive the shades of sin away . . .
Issa shook Eron awake. Memory slowly probed through mental haze.

"What do we do today?" he asked.

"Talk. Listen. Then we go home," Issa replied, with a confidence that surprised her.

"Let's get busy then," Eron said without conviction. He looked around and thought, "We may still have to fight our way out."

They were given time to breakfast and prepare themselves for the day before a crowd of St. Ignatian "men" approached. The St. Ignatians stood in ranks while one came a few steps closer.

"Good morning," came the disconcerting chorus.

"Good morning," Issa replied. Eron merely nodded and smiled.

The leader of the St. Ignatians spoke for a considerable time without saying anything the explorers could hear. Eron and Issa both watched the intricately subtle facial and hand movements that accompanied the speech. Finally, there was a whisper that couldn't quite be heard, and then: "Please excuse me, but I wanted to find out how many voices are needed." Issa nodded. About half the St. Ignatians left, leaving nearly 200 to help their leader communicate.

"I am Pope John Dominic the 17th, Supreme Pontiff of St. Ignatius."

* * *

It was a busy and frustrating day for Eron and Issa as they tried to learn about St. Ignatius. The St. Ignatians had no memory of a time when their ancestors had looked any different. "We are what we are. Were it not for our infants, we might not have accepted that you too are human." Science was virtually nonexistent. To Issa's question about the signal beacon and the hedge around the spaceport, John Dominic replied, "It is our duty to keep the Holy Caller working so our Savior can find us when He comes. The hedge protects the Sacred Plain where He will land. Maintaining them is the honor of the College of Cardinals." On history: "Our loremasters keep alive the Bible and the hymns of praise. They keep us from error and sinful innovation." John Dominic had no idea when the other animals had learned to mimic their voices. "We sing and they sing."

"Even the insects?" Issa asked, and John Dominic shook his head, his brow contracting at the sound of her voice.

"Why would you think that?"

"The singing inside the church."

"Oh, no. You heard the church singing, praying to the sky as it was taught. She leads our devotions. she is our best loremaster, our link to the holy past."

"The church is alive?"

"Why not? She can never die. Our Savior promised. Her body was never pierced by the spears like some. She is as alive as the other unpierced trees, as alive as the trees across the river. We keep them watered and nurtured. They all pray for the Second Coming, that they may be healed."

During a break for supper, Eron said

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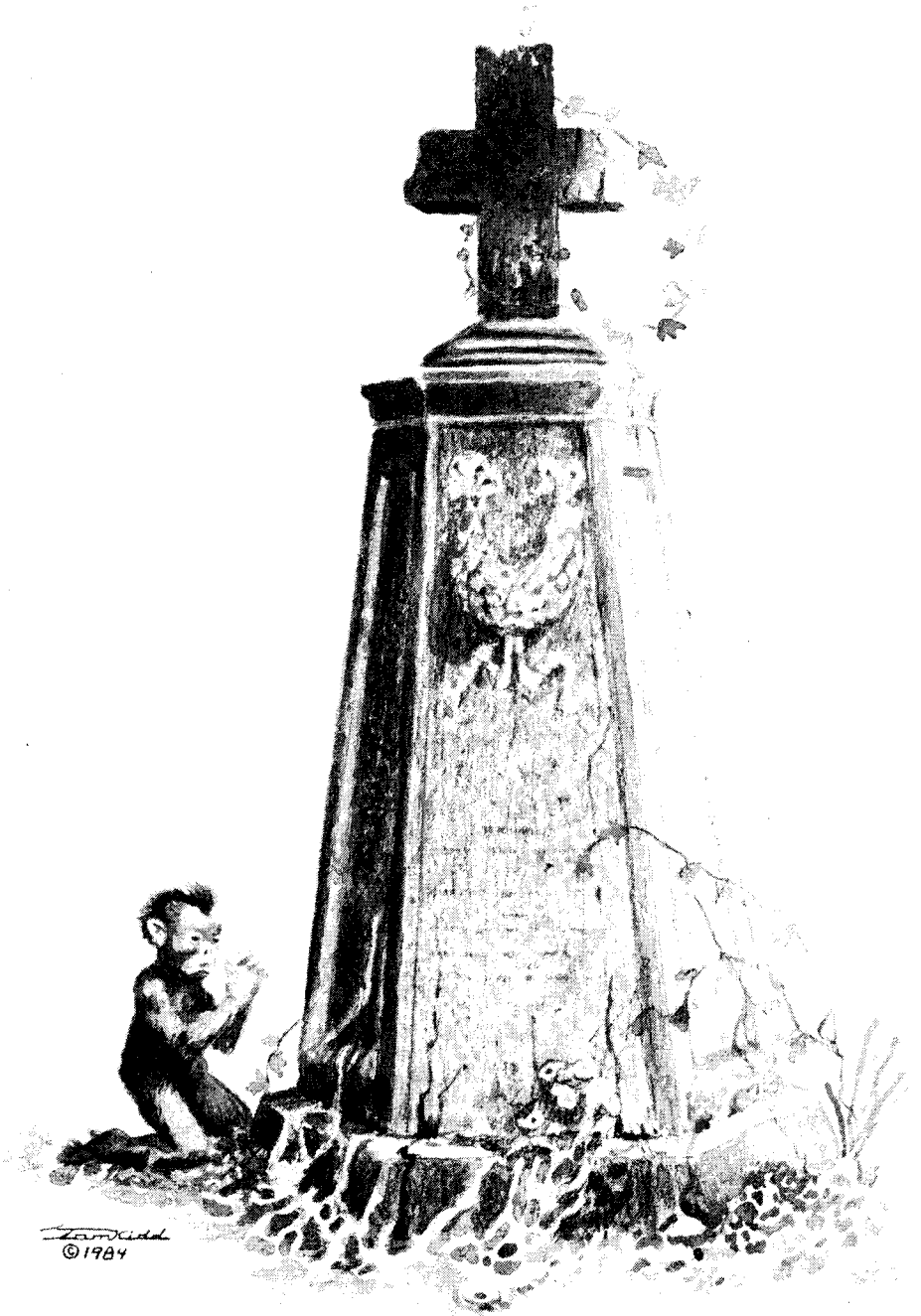

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suddenly, "The church, that's the last link."

"What're you talking about?"

"Language. The church has their language locked into the past. The little gestures, or lip-reading, whatever it is that they use among themselves, won't work with the church. That has to be it."

"So?"

Eron shrugged. "Another piece of the puzzle."

"You know us," John Dominic said late that evening, "all there is to know. We would like to know about you, and how Earth has fared."

"We'll try," Issa promised. She and Eron talked about Earth and the recent discoveries. The new wonders of faster-than-light travel did not impress John Dominic, nor did any scientific matters interest him.

"Does the church flourish?" he asked when his patience was exhausted.

"I don't think I'd say it flourishes," Issa said. "It continues. It survives."

"Hasn't our Lord come again as He promised?"

"No. Not many people really believe that He ever will."

That completely disrupted the St. Ignatian chorus. Instead of speaking in unison, they were evidently arguing among themselves. Eron and Issa only heard occasional screeches. John Dominic needed all of ten minutes to restore his chorus.

"Excuse us, please. This is most painful news. May we continue our discussion in the morning? We need to pray over this."

John Dominic and his entourage raced toward the river. Eron started another pot of coffee. Before it boiled, the singing began.

O darkest woe! Ye tears, forth flow!
Has Earth so sad a wonder . . .

One after another, hymns of mourning and hope, despair and prayer, came. The explorers went to bed. The hymns continued, plaintive with longing.

Nearer, my God, to Thee,
Nearer to Thee.
Even though it be a cross . . .

Then, with the rising of the sun, the voices became more powerful, charged with faith. Even the church joined in the chorus.

Onward, Christian soldiers,
Marching as to war,
With the cross of Jesus
Going on before . . .

Eron and Issa were in front of the church to meet the St. Ignatians. A huge crowd accompanied John Dominic this time. After a brief exchange of polite greetings, John Dominic spoke up.

"We want to go home to Earth. Will you take us?"

"Of course. We'll be happy to take a delegation," Issa said.

"You don't understand. We must all go."

"Our ship isn't nearly large enough for that."

"It is necessary," John Dominic insisted. "You have a vessel that can make the journey. Therefore, you must take us."

"Why must you all go?" Eron asked.

"We are most obviously needed. If our Lord has not returned, then Earth must have left the path of righteousness. We must show the way."

"It wouldn't help," Eron replied.

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"Only people who already believe would even listen. That's what all religions are like on Earth."

"How can there be more than one religion?" John Dominic asked, and his chorus managed to convey his incredulity.

"There always have been," Issa said, "even when the Lord was on Earth."

"We will bring the truth. Everyone must listen to that."

"No," Issa said, "they won't. You're better off staying here, where you have no doubts or dissension."

"You refuse to take us?"

"We will take as many as our ship will hold, forty or fifty, perhaps."

That occasioned another heated discussion among the St. Ignatians. When it was over, John Dominic repeated his logic. "We must all go to Earth. You have a ship. Therefore, you must take us. If you refuse to take us to do God's work, we must assume you belong to the Devil. I ask again: Will you take us to Earth?"

"I gave you the only answer I can. Our ship won't hold all of you."

"With God, nothing is impossible. We give you until the sun is above your heads to examine your souls and reconsider."

'We can show you our ship. It's just too small."

"Unacceptable. Unless you redeem yourselves, we give you to the missionaires of the Inquisition for the salvation of your souls."

John Dominic and his chorus left. A new cordon was placed around the church. The change in status from guests to prisoners was transparent. Eron and Issa went inside and closed the door.

"They're asking the impossible," Issa said. Eron just nodded. He was busy listening to a recorder.

"What have you got?" Eron held a finger to his lips.

"Just passing the time." He listened to the end of the recording and reset the machine. Then he stuck it in Issa's ear. While she was listening, Eron got a pen and pad and wrote, "I started recording what they were saying among themselves last night. Nosy of me, wasn't it?"

Issa nodded and took the pad. Her face drained of color. The argument following Issa's statement that people no longer believed in a Second Coming brought a gasp from her. And then there was the morning debate, just before John Dominic threatened them with the Inquisition.

"Bring down the digger, NOW!!" Issa wrote.

Eron nodded and took the pad. "I think I've figured out a way to get us out," he wrote. "Just follow my lead, okay?" A nod was answer enough. Eron started to work with the equipment they had in the church.

Minutes before Issa or Eron could see the heavy lander, the St. Ignatians heard it. They came closer to the church. More crowded toward the center of town. Eron opened the church door. Issa opened the shutters of a window on the other side. Both had slipped on their packs, but they hung loosely, holding only the few things they didn't dare forget. Eron had film and audio chips. Both

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had seedlings and cuttings from their first day on the surface.

The shuttle landed right in front of the church door. It was only slightly larger than the shuttle that had brought them down from the ship, but it had two mechanical appendages normally used for excavating and taking deep samples. The demands of those tasks meant that the digger was structurally stronger.

"Now!" Eron screamed. "Yell, whistle, make noise." He started shooting at the buildings in the inner circle while he shouted. Fires started quickly. Issa matched Eron's actions. The noise was deafening. Eron had arranged the dozen speakers they had, tuning them all for full volume. Microphones faced speakers, setting off a screeching feedback.

The St. Ignatians had started to rush the church to block any escape. The metallic screech of sound systems cannibalizing themselves stopped the charge. Paws, or hands, reached to stop up bloody ears, trying to shut out the noise and pain.

Eron raced to the lander and hurried through the opening keycode. A few St. Ignatians were still trying to reach him, ignoring their pain and disorientation. Eron and Issa shot them without hesitation. Fires crackled and snapped. Wood moaned its agony. Speakers continued to screech and echo. Eron and Issa reached the sanctuary of their shuttle. With the hatch secured, they were safe. Eron cut off the amplifiers.

They watched the town burn. They watched St. Ignatians start to move again. Some of them. Others remained motionless, possibly dead, probably deaf.

"I wonder if they'll ever recover?" Eron asked.

"Will we?" Issa replied sadly. "Get us out of here."

Eron moved to the pilot's seat and lifted the lander out of the town. The fires were spreading, but the church seemed safe. Thirty meters up, Eron halted the shuttle's ascent. The craft hovered silently. Eron trained a camera on the peninsula and dialed full magnification.

"They weren't going to waste much time trying to convert us," he said. Issa turned to look at the monitor. In front of Father Eberhart's tombstone were two new structures, high wooden crosses.

"Meant for us," Issa whispered. Eron's recording made that clear. The argument had been whether to crucify them before they took the St. Ignatians to Earth or afterward. "We'll be much too busy to crucify them after we start redeeming Earth," one argument had run. The counter was, "But we can't get to Earth without them." "The Lord will provide."

"We couldn't let them loose on Earth," Issa said quietly, but tears streamed down her face. "We couldn't handle that kind of religion again. Bring the other lander up."

"Think they may have learned how to get into it yet?"

"It doesn't matter. Lock it in orbit and program it to broadcast a warning if any of our other ships happen by."

"What kind of warning?"

Issa thought for a moment and then said, "Identify our ship and add, 'Beware the wrath of God. Do not land.' "

Earth was less than a week away.

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After sixty days, Eron and Issa were nearly home from St. Ignatius. Their film and audio records had been edited and annotated. Their reports had been composed and recorded. They had time to relax, time to recover from their fears, except for the recurrent nightmares that might need intensive therapy to defuse.

They had time to make plans, time to dream. In the language of their childhood.

In the hydroponics cabin, the seedlings and cuttings from St. Ignatius had been placed in nutrient media and labeled, along with samples from a dozen other worlds. The young plants from St. Ignatius thrived in the artificially stimulated environment. Too faint and high-pitched for even ship's instruments to detect, they consoled themselves at their exile and made plans for the future.

In the sweet by and by
We shall meet on that beautiful shore,
In the sweet, by and by . . .

And, ever so gradually, ever so feebly, a few of the plants from the dozen other worlds started to sing along. ■

DR. THOMAS C. RAINBOW
1954-1984

"Tom Rainbow" is a relatively new name to *Analog* readers. As I write this, that byline has appeared on only one story in these pages, but I knew Tom well enough to hope that there would be many more.

Most regrettably, there will not be. Tom (otherwise known as Dr. Thomas C. Rainbow, neuroscience researcher at the University of Pennsylvania) died in an accident near his home on September 6, 1984. He left several articles still to be published in a popular series in *Isaac Asimov's Science Fiction Magazine,* and one or two stories may yet find their way to *Analog.* But beyond that, at least two fields have lost a very promising young man, and his readers will have had only the briefest glimpse of that promise.

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Probability Zero

SEX & DRUGS & ROCK'N' ROLL

Dr. John Gribbin

I have found the meaning of life. You won't be surprised to learn that it isn't simple. In fact, it involves the latest developments in many different scientific disciplines, and the arts as well. So bear with me while I begin at the beginning, and I'll fit the pieces of the jigsaw puzzle into place: the overall picture should start to emerge very quickly.

There is now very little doubt, of course, that life did not originate on Earth. Astronomers and geologists have established that the Earth and Solar System were born out of a cloud of cosmic material about 4½ billion years ago, and the paleontologists have found fossilized remains of single-celled life forms in rocks that were being laid down only 300 million years later. These early life forms were "only" bacteria—but they were living things, using the same basic genetic code as we do. The gulf between non-living things and simple bacteria is far greater than the gulf between bacteria and ourselves, in evolutionary terms, yet it took a further four billion years to evolve from bacteria to us. So where did the original bacteria come from?

The great British astronomer, Sir Fred Hoyle, has the answer. In a series of brilliant research papers and books published recently—but not always taken as seriously as they deserve by the establishment—he has shown how life must have evolved in clouds of material in space, where there was ample time available. He goes further. He suggests that the Earth was deliberately seeded with life by intelligent beings, and, of course, he is right. The purpose of life on Earth is to evolve in accordance with the genetic blueprint laid down by those beings in the beginning. That evolution had led inexorably to the rise of an intelligent species, ourselves. And I believe we are on the verge of achieving the ultimate goal.

If mankind is the end point of evolution, then our special characteristics must be what life on Earth has been designed to produce. What are those special features?

The most important thing that distinguishes us from the original bacteria is sex. Most of our body cells are just like the cells of simple organisms. But instead of reproducing simply by budding off a few cells annd letting them grow into exact copies of ourselves, we make special cells which need to combine with special cells from another individual. The greatest distinction in the living world isn't between plants and animals, but between the sexual reproducers and the asexual. And what does sex do? It provides for variety, producing different kinds of new individuals with new features. It's only in the past couple of years, however, that molecular biologists have found out exactly why that is so useful.

I won't bore you with the details. But, putting it simply, the great advantage of sex in evolutionary terms is that it enables the body to fight disease and keep out invasions by foreign single-celled organisms, the descendants of those original bacteria. Each cell of your body carries its own set of recognition codes, molecular passwords which identify it as part of your body and keep it safe from attack by the special cells that fight invaders. The invaders "learn" the passwords after a

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time, but through sexual reproduction each individual person in each new generation inherits a completely new set of passwords made from bits and pieces of his parents' passwords scrambled into new patterns. Thanks to sex, we evolve new passwords faster than the bugs can crack the code, and that's what keeps us healthy.

At least, it was the way we kept healthy until recently. But now things have changed. We have modern medicines—drugs—to control disease even more efficiently. The first important step toward understanding the secret of life is the realization that *drugs make sex redundant*. We don't actually need sex any more. We don't need variety, and that means that human clones can now be regarded as a good evolutionary bet. Why bother with billions of different people if you can make do with billions of copies of one? Why bother with sex? As Groucho Marx put it, "the screwing you get ain't worth the screwing you get."

So, what else is special about people? Many species use sex, so that can't be the sole secret of life. To see what's really special about us, we have to look at our very nearest relations out there in the animal world, the African apes. We actually have two closest relations, the gorilla and the chimpanzee. The relationship is so close that the African ape family is best thought of as including three members—ourselves, the chimp and the gorilla. Our relationship is so close that the DNA molecules in your chromosomes are 99 percent the same as the DNA of each of our cousins. Whatever makes us special, the other apes must share a big part of it. So what can we three do that other animals can't?

Look at the anatomy of the apes. We're very proud of the fact that we walk upright. But the reason we walk upright is actually because our ancestors lived in the trees, swinging beneath the branches from hand to hand. This way of life—brachiation—produced an upright body form ready to make the transition to walking. Only the chimp and the gorilla share this brachiating structure, and it gives them an ability shared only with us.

Brachiation involves a specially mobile shoulder joint and long arms. Try reaching over your head with your left hand and touching your right earlobe. Of course you can do it—so can a chimp or a gorilla, but *no other species that has ever lived on Earth!* This must be close to the ultimate secret. We, and the other apes, can stand upright and use our flexible shoulder joints to gyrate underneath our long arms. Its called dancing—a special kind of dancing—*only apes can rock'n'roll.*

Now we are getting somewhere. All that is left is the one per cent of DNA that makes us different from the other apes. What does that do? Apes are pretty intelligent, so it can't be that. They can even be taught to communicate, but only using sign language. That is the clue. The last thing that makes human beings special is the ability to communicate verbally—to speak and, crucially, to *sing*. Man's unique ability is a combination of rock'n'roll dancing and vocalization—rock music.

At the same time that we have evolved this ultimate capability, we have conquered disease and removed the need for sex. It is all part of our biological imperative; and the ultimate purpose for evolution, tailored in our DNA by superintelligent beings from space, is to produce clones that make rock music. Have you ever wondered about all those bands whose members look alike, sound alike and are of indeterminate sex? They, my friends, are the ultimate achievement of evolution. Everything points to one conclusion. The purpose of life on Earth is to relieve the ultimate boredom of beings that have been around for immeasurably long spans of cosmic time. We are here to create the ultimate rock band. Unless something is done quickly, the entire world will end up in that state. . . . ■

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the reference library

By Tom Easton

Frontera, Lewis Shiner, Baen Books, $?, ?pp.
The Continent of Lies, James Morrow, Holt, Rinehart and Winston, $15.95, 274 pp.
Conscience Place, Joyce Thompson, Doubleday, $13.95, 225 pp.
Valencies, Rory Barnes and Damien Broderick, University of Queensland Press, $7.95, 230 pp.
Blank Slate, Mark J. McGarry, Signet, $2.95, 288 pp.
Midway Between, Warren Norwood, Bantam, $2.75, 256 pp.
The Day of the Dissonance, Alan Dean Foster, Phantasia Press, $17.00, 269 pp.; Warner, $2.95, 292 pp.
Voyage to the City of the Dead, Alan Dean Foster, Ballantine/Del Rey, $2.95, 256 pp.
. . . Who Needs Enemies? Alan Dean Foster, Ballantine/Del Rey, $2.95, 272 pp.
Fuzzies and Other People, H. Beam Piper, Ace, $2.95, 224 pp.
The 1984 Annual World's Best SF, Donald A. Wollheim, ed., DAW, $2.95, 256 pp.
Isaac Asimov's Wonderful Worlds of Science Fiction #2: The Science Fictional Olympics, Isaac Asimov, Martin H. Greenberg, and Charles G. Waugh, eds., Signet, $3.50, 357 pp.
Women of the Future: The Female Main Character in Science Fiction, Betty King, Scarecrow Press, $18.50, 295 pp.

Another year is done, another enormous pile of books is past, and still another lies ahead. The reviewer's task is truly Sisyphean, but it has its moments. One came when the replies showed up to the appeal for help for the blind reader in Fort Worth. Four of you answered, one even willing to transcribe SF into braille. No one answered from Texas, but I heard from Fort Worth of new friends and broadened horizons. Thanks.

Another moment comes when I take the opportunity to plug my own books. Last year saw no SF, but Plexus brought out *Working for Life: Careers in Biology*. Dow Jones-Irwin did *Careers in Science*, and Merrill did the second

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edition of *Bioscope*, an introductory college biology text (coauthored with Carl Rischer of Long Beach City College). 1985 will soon see my and Ralph Conant's *Using Consultants: A Consumer's Guide for Managers* from Probus, and later *Cutting Loose: Transitions From Employee to Entrepreneur*. Ralph is the congressional hopeful I mentioned to you once; he lost his primary last June, and as his "science advisor" I nudged him into other projects.

You say you'd rather hear I'd published a novel? Maybe, one of these days, though of course *I* won't be able to review it (that might be a good occasion for a guest columnist, or for one of Stan's occasional addenda). In the meantime, let's see what I've been reading lately.

First is Lewis Shiner's **Frontera**. Shiner's world is one of bankrupt governments worldwide, where corporations have filled the gap, even unto providing social services. Hero Kane is the son of the founder of Pulsystems, a Houston company controlled from Japan, but the founder is dead and Kane and company are ruled by his jealous uncle, Morgan, who is less than willing to see the heir made more than apparent. At one point, therefore, Morgan puts his nephew into the front lines of a company war over a North African biolab that has developed "wetware," biological computers that can be implanted in a human brain. Injured, Kane winds up with a sample of the wetware in his own skull, supposedly to compensate for brain damage. The experienced reader is immediately suspicious.

When the governments fell, they had to abandon U.S. (Frontera) and Soviet colonies on Mars. The two merged and survived, and the colonists' mutant children have begun to develop a new technology of matter transmission. Morgan wants the gimmicks, and with the remnants of NASA apparatus, he mounts an expedition. Kane goes, along with an aging astronaut and a Japanese VP. On Mars, he finds suspicion, conspiracy, violence, and destiny.

Shiner handles his plot and his people well, but his sensory competence seems far more visually thing-oriented than otherwise. He does not capture internal sensation well or consistently—for instance, when Kane breaks ribs during deceleration, his pain seems pale and does not dominate his thoughts or limit his actions as much as I would expect. One other sensory problem is that Shiner turns Mars's famous pink sky blue and green.

The only other major problem is the mutant children, produced by the high level of radiation that reaches the Martian surface. Mutants are a fixture of SF, and an unfortunate fixture most of the time. Few writers or readers seem to know or care that they do not arise so conveniently, after only a generation or two of exposure to radiation, or that their mutations are highly unlikely to be conspicuous or beneficial.

Ignore the problem if you wish. Shiner has produced a good tale, one that will entertain for the necessary evening or two, and he shows promise for the future.

James Morrow's **The Continent of Lies** is grotesquely flip. Would you believe a glass eye containing a live guppy? A drug blast in the belly of a rankly dead whale—er, *grorg*? A science fiction convention disguised as a dreambean con? They're all there, and more, in this tale of delusion defeated.

The story is told as from some years after the banning of dreambeans and their use. Dreambeans or cephapples are

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a planet-sized sentient plant genetically engineered to produce fruit—the beans—which, when ingested, induce dreams of surpassing vividness. Each plant's beans tell a single story; the engineers who produce them are this future's equivalent of writers, and their planters are publishers. Hero Quinjin is the necessary critic, making his living by dining regularly on beans and passing his inflated opinions on to the readers of *Dreambeans Deciphered*. Note, please, just how intrinsic is Morrow's flipness to his story. The bad jokes are his, not mine; I will plead guilty only to being a reviewer and hence less than totally sympathetic to his satire.

As a critic, Quinjin is invited by Clee Selig, inventor of the beans, to sample a "lotusbean," designed by a rogue student of Selig's who believes it possible to "write" a dream that carries absolute conviction. The student, Kusk, had made an earlier attempt that, released to the public, had consigned its eaters to the madhouse. The new bean, titled "The Lier in Wait," locks its eaters into a new and maniacal religion whose god is Kusk. He intends to rule the universe.

Being a critic, Quinjin's *will* survives the experience, and he accepts the assignment to hunt down and exterminate the source. With him go Selig's robot, a past lover, a playboy, and his own daughter. When his daughter eats "The Lier in Wait," Quinjin gains painful motivation, and after a long, convoluted, frustrating search, he fulfills his mission.

Morrow is ingeniously inventive, manically creative, incisively witty. He is a Goulart with substance—though the critic or reviewer is forced to gag just a little when that substance wriggles on the way down. He is worth reading.

And here come da mutants again! Joyce Thompson would have us believe that nuclear power plants have been leaking rads all along in such quantities that the U.S. government has found it necessary to sequester a horde of deformed babies in the **Conscience Place**, where they can live their own lives, suitably uninformed of how to go about reproducing (their tailored language lacks the words), suitably prosthetized, suitably accepted by each other, and thoroughly studied by social and biological scientists. The residents seem to have adapted to their handicaps quite admirably, largely because, isolated, they think their lack of uniformity and symmetry is normal. However, the story's main narrator lacks only legs, not brains, and he is disturbed by the birds he records in his videotaped documentaries.

We also see the Place through the eyes of the resident scientist, a woman who wears a disguise over her normality. She leaves the Place periodically to meet with her fellow scholars, and when she finds them plotting to make the Place "relevant" in response to Washington budget pressures, we share her alarm. When basic research in fact turns to applied research, despite an attempt to blow the whistle, we feel like vomiting.

The Place itself is an idealistic vision. If we truly cared about the handicapped, if we were truly capable of abjuring prejudice, we might make such a world of our own. But we are not and do not. We cannot. And Thompson knows it; her gritty, gritty ending totally belies any possible charges of naiveté.

So the author is a realist. She is also a skilled, thoughtful, sympathetic, empathic writer with an immense gift for creating believably outre characters. My objection is that she is also hysterical about the dangers of nuclear power. She has failed to temper her profound hu-

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manism with technical education, and her ignorance shows, as it so often does when mainstreamers step into the realm of SF.

Valencies, by Rory Barnes and Damien Broderick, comes from the University of Queensland Press; you can order it from 5 South Union Street, Lawrence, MA 01843 (617-685-3306). A cover blurb worthy of the critic Quinjin calls it "an attempt to 'premember the future' " with a theme of "dominance and submission, both in the political sphere and in the relationships among its characters." It thus has its share of pretentiousness, though it may take its "premembering" seriously: the book tells us that the entire universe—all 100 billion galaxies, with 2.5 million habitable planets apiece—is settled by 10^{27} people (four billion per world), a number that is just about right for what present population growth rates could achieve by the story's year of 4004 A.D. Government is an Imperium guided by a social version of statistical mechanics and modeling with "mimetic hypercycles," tailored genes that stochastically act out the future.

The plot—a futile attempt at rebellion—is trivial. The story is a portrait of the future, the people, and their lives within the Imperial machinery. As such, it is interesting enough, but one wishes for more, for some sense of movement more definitive than the wheel-spinning of adolescent rebellion. One wishes also for something more believable, for the story's rebels are not adolescents, but immortals who show no signs of growing up.

Mark J. McGarry's **Blank Slate** is a caustic condemnation of nationalism and racism that might have been written any time in the last two decades. Over a century before the story, Earth received matter-transmitting "portals" from benevolent aliens and used them to establish several colonies on distant planets. One—Relayer—was a desolate, lifeless orb settled by gung-ho Israelis, Basques, blacks, and Chinese.

Trouble came when alien hordes poured through Earth's portal and Earth closed the door by nuking Omaha. Plagues swept the planet. Millions died. The colonies were abandoned. Earth rebuilt its civilization around shiny urban enclaves surrounded by slums where the poor, uneducated, and jobless survived—until Terminal Night, when a supposedly mad leader poisoned most of them. Earth, except for isolationist Asia and darkest Africa, is white and elite.

The story centers on Kearin Seacord, an artist from the slums who works as a secret agent able to change his personality to suit his mission. He is backed up by the world's Datanet and companioned by its sentient facet, Sara, as he collects information on which others act. His current mission is to ride the starship *Belfast* (presumably not named after my home town) on the first visit to Relayer since its abandonment. He will appraise its condition and report. He will also look for evidence that the aliens remain a threat.

He finds no live aliens, but he does find that Relayer's groups have become castes, the Israelis on top. They thus serve as a mirror for homogeneous Earth, which retains the same basic sectionalism, though there it is bureaucratic fiefs that take the place of nations and the slums that define a lesser race. McGarry seems to peg the ills of human civilization to basic territoriality. If he offers no solution, that may be because he sees none.

In the service of his theme, McGarry

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displays a fine imagination, nicely projective, not too outre, and an adequate sense of character and action. The book is a good read, and worth its price.

Warren Norwood's hyperactive imagination is unrestrained by any pretense of technical reasonableness. In **Midway Between**, which begins his new Double-Spiral War trilogy, he has a planet defending itself against unwanted exploitation by igniting the surface of its methane atmosphere:

"Fire, ignited by the Isthians after Leri's kidnapping, burned on the fringes of Cloise's atmosphere.

"Oxygen freed from methane fed the slowly growing flames. Heat from the fire freed more oxygen. The fire grew. . . ."

I submit that this is an awful chemical gaffe. Ignoring the stylistic clumsiness of the passage, accepting for the moment that methane can fuel a spaceship (without mention of an oxidizer or a fusion drive), it is enough all by itself to make an *Analog* reader bounce the book off the nearest wall.

Norwood's point seems to be the futility of war, for he offers a complex politico-military adventure that concentrates on the people who fight the battles. Most seem hyperbolically sketched and hence to some degree unrealistic. The war's sides are very poorly distinguished, mostly by the differing labels for their governing apparatus. The battles are miserably motivated or justified, with the prime battle, for a system midway between two stellar hegemonies, happening only because no one seems to appreciate the three-dimensionality or scale of space.

Future volumes promise more futility and technical idiocy despite superweapons, blood, smoke, and glory galore. Avoid them.

* * *

Alan Dean Foster is more satisfying. He doesn't always try to dramatize great themes or messages, but he does deliver good, carefully worked out entertainment. And I have three examples here.

The best of the three is **The Day of the Dissonance**, third in the Spellsinger series (all three are available in a single deluxe volume from Phantasia Press). Here, legal student and rock guitarist Jon-Tom, spell-transferred resident on a world of sentient animals, must go on a long quest for a magic potion to cure his mentor wizard's ill. His unreliable spell-singing ability gets him and his companions, one of whom is a charming tigress warrior, in and out of trouble, past rival wizards and pirates to the multidimensional emporium that is his goal. It's good, clean fun, folks, even if the unicorn is gay.

Voyage to the City of the Dead is somewhat less charming, for it is a traditional *voyage extraordinaire*. Human geologist and sociologist Etienne and Lyra Redowl are visiting the planet Horseye, cleft by a single humongous valley system, relic of a meteor strike, in which live three sapient species. From tropic lowlands to arctic heights, they pursue their curiosities, through native treacheries and natural obstacles. It's a grand tour with bickering, for the Redowls are constantly chewing at each other, which seems an inadequate substitute for characterization. It sometimes plods as well, despite the wonders on every hand. Yet it rewards the patient reader with a dazzlingly cosmic vision of the future of the Humanx Commonwealth. It thus belongs in any Humanx collection.

. . . Who Needs Enemies? is the collection of short stories to follow *With*

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Friends Like These . . . The contents are all entertaining, though only some offer much substance and the letter-story "Swamp Planet Christmas," though clever, hardly deserved reprinting. The novelette "Snake Eyes" tells us why Pip once abandoned Flinx. "Bystander" offers a sapient comet. "What Do the Simple Folk Do . . . ?" gives us interactive TV plotting, with real blood. "Gift of a Useless Man" turns a derelict into a resource and stimulus for a bug civilization. "Surfeit" concerns surfing. "The Dark Light Girl" mutates people (again!) into giant fireflies. "Instant with Loud Voices" computerizes the shroud of Turin. "The Last Run" is a pungent race with the devil, and I found it the best in the book. "Wu-Ling's Folly" puts a Chinese dragon in the American Wild West. "Village of the Chosen" trivializes the whole idea of little green men (and women).

H. Beam Piper's Fuzzies have attained surprising popularity, much to the gratification of his heirs. However, Piper apparently only wrote *Fuzzy Sapiens* and *Little Fuzzy*. No one could find among his papers any trace of the third book he had said he was working on shortly before his death. Ace had to commission sequels from other writers.

But now—fanfare, please—Piper friend Mike Knerr and cousin Charles Piper have found the missing novel in a box mislabeled "pens and second sheets." It's **Fuzzies and Other People**, and it reads very much like more Piper. A sequel to the other two books, it deals with the villains' efforts to reopen the planet to ruthless exploitation by proving Fuzzies are not sentient in a human way. Their vehicle is a trial for enslavement and faginy of three humans who had used Fuzzies to swipe sunstones. Chief villain Hugo Ingermann intends to block Fuzzy testimony by claiming that Fuzzies can't testify because the court's truth-detector won't work on them. The problem is that the veridicator never flags Fuzzies as lying because they always tell the truth. In order to prove it *can* tell when a Fuzzy lies, heroes Holloway, Grego, *et al.* must therefore teach Fuzzies to lie. It's a frustrating task, for a Fuzzy can say only what it believes to be true. Fortunately, while all the human machinations are going on, a wild Fuzzy is learning to manipulate his fellows by telling fictions. When Little Fuzzy, lost in the wilderness, finds this prevaricator and brings him to town, he saves the day. And Fuzzies take one more step toward their own version of humanity. They are growing up, leaving behind what Piper tells us is the reason for their great popularity: they are stand-ins for human children at their most lovable age.

It should be possible for Ace to commission still more Fuzzy novels. Following Piper's own pattern, the next might have the Fuzzies grow up a bit more by discovering sin, jealousy, and other "adult" traits. However, this could only spoil their appeal. Far better it is to leave the saga where it is right now.

When I reviewed Gardner Dozois's *Best of the Year* anthology last month, I said I expected the DAW and Carr *Bests* would prove to be thoroughly duplicated. Well, I still haven't got the Carr volume, but Donald A. Wollheim's **The 1984 Annual World's Best SF** has only two of Dozois's picks. 43 the other eight, four appear on Dozois's "Honorable Mention" list; they are Asimov's "Potential," which concerns the search for a genetic correlate for telepathy; Jo-

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seph H. Delaney's "In the Face of My Enemy," in which an American Indian long ago "adjusted" by alien visitors to Earth plays a crucial role among the stars; Mary Gentle's "The Harvest of Wolves," of after-the-eco-collapse selfishness; and Silverberg's "Homefaring," of a future-visiting man who becomes a lobster, and likes it. The uniques, some of which are better than the others, are Pohl's mordant "Spending a Day at the Lottery Fair"; Thomas Wylde's "The Nanny," which tells how one man defeats disaster to raise a crop of colonists; Don Saker's "The Leaves of October," in which a sentient tree comes to speak for humanity; and Tanith Lee's "As Time Goes By," a timeless tale of love and fate. The whole makes a rather better impression than last year's volume, for Wollheim has picked a more thoughtful batch of stories.

Isaac Asimov's Wonderful World of Science Fiction #2: The Science Fictional Olympics, edited by Asimov, Martin H. Greenberg, and Charles G. Waugh, is a disappointment. The stories are all fine, all concerned with extremes of competition, but only three of 17 have anything to do with the Olympics: Tom Sullivan's "The Mickey Mouse Olympics," Mike Resnick's "The Olympians," and Nicholas Yermakov's "A Glint of Gold." The rest deal with academic exams, football, wars, races, gladiators, and the everyday like. The editors try to justify their title with an introductory apologia, but I suspect the title was forced upon them by the book's timing.

Betty King's **Women of the Future: The Female Main Character in Science Fiction** is a "reference work" aimed at women who seek role models in their reading. It begins with a historical overview from *Frankenstein* to 1929 and follows with chapters for each of the succeeding decades. Appendices cover collections and anthologies, erotic SF, and Amazon women.

The decade chapters are essentially sheaves of reviews, each one organized around the main character and her physical, mental, and emotional characteristics, with story synopses. Novels are well represented; short fiction appears only when it is available in book form, and hence findable in libraries. The book is thus something of a nostalgia trip for long-time readers of SF, and it is interesting for what it reveals of changes in the treatment of women in SF. It lacks, however, precisely what King was not aiming to provide—any scholarly discussion of those changes. Such a discussion might have helped the book achieve its stated aim of guiding women to SF that does not insult them by providing a guide to the future. Some appraisal of magazine and editor attitudes might also have been useful. ■

● Change is one thing, progress is another. "Change" is scientific, "progress" is ethical; change is indubitable, whereas progress is a matter of controversy.

Bertrand Russell,
Unpopular Essays

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brass tacks

Dear Stan,

I don't want to shoot down Frank Catalane (Brass Tacks, April 1984), because newsmen who are for the space effort deserve our full support in turn. Besides, I can't speak for the position in the USA. But there are media people who are dead against the whole thing, and two examples out of many from my own experience may suffice.

1. When my second book was published on the exploration of the Solar System, I was subjected to a radio interview so hostile that the producer was moved to protest. The reporter in question, one of the most respected in the BBC at that time, replied to him, "The Moon is a damned great sterile golf course and if I have my way no one will ever go back there." This was nearly seven years after the last Moon landing, and I leave you to imagine how any junior reporter trying to support space exploration would have fared under him.

2. Before the SMM repair team had even returned to Earth I heard the following interview with a regular studio expert. (It's a scribbled note, not a transcript, but it's pretty accurate).

"Interviewer: Well, the Long Duration Exposure Facility has been deployed, ---- (first name), and the Solar Maximum Mission has been repaired and returned to orbit; so how can the present shuttle mission be dismissed as a failure?

"Expert: Oh, that's easy ---- (first name); the astronauts were to have retrieved the damaged satellite by docking to it, but they completely failed to do so. The fact that it was retrieved afterward by the remote arm is a pure coincidence.

"Interviewer: I see. So we can agree that, once again, the space shuttle has failed to accomplish its objectives?

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"Expert: Yes, indeed. As I've so often said on this program, the whole shuttle program is a waste of time and all of it could be far better accomplished with unmanned spacecraft."

Of course, not all media people are like that, but to make out that *none* of them are like that would be to overlook a dangerous segment of the opposition.

DUNCAN LUNAN

Scotland

Dear Dr. Schmidt,

Although I enjoyed some of the anecdotes in Margaret L. Silbar's article "Born-Again Ideas," I must admit to some irritation at once again seeing the work of the historians of science ignored in an article dealing with major issues in the history and the sociology/social history of science. Not one of the articles cited in her bibliography was from a primarily historical journal rather than from a science journal which occasionally published an article on the history of science.

Ms. Silbar disassociates herself from the comment of a physicist that "physics has no history," but she does not go the next step to discover that there is a well developed history of physics (and science in general) and that about two decades ago the history of physics and science in general were revolutionized by the publication of Thomas Kuhn's *The Structure of Scientific Revolutions*. I strongly recommend this book to anyone interested in how scientific change takes place. Silbar's question of why ideas and inventions are often ignored in one era only to be rediscovered in another is plausibly answered by Kuhn's description of scientific communities and research paradigms. His work is also quite relevant to the question, often raised in the pages of *Analog*, of why scientists often ignore certain areas of investigation.

Kuhn's description of scientific activity humanizes it and brings the history of science up from mere self-congratulatory narrative to the realm of real critical and analytic history. Since Kuhn's work was published, many historians have applied his analysis to other areas of human activity, including the social sciences, economics, and even the arts. Surprising parallels have been found in the ways communities of scholars create or fail to create or accept new ideas.

The idealized image of science and scientists, whether found in a science textbook or in a more sophisticated form in the philosophy of Karl Popper, is not supported by historical research and impedes the ability of the educated public to understand and judge issues of policy relating to science. While Kuhn's work has flaws (he puts too much stress on the self-contained community and not enough on outside social and economic pressures), it now forms the basis for a scholarly investigation of science as a social phenomenon. Contributors and editors of science fiction/fact journals should be aware of recent trends in the history of science when attempting to speculate on the future of science and society. I would like to see a story based on the concept of "paradigm shift."

I believe that a better acquaintance with the best in twentieth century historiography would benefit many science fiction writers, particularly those who deal in alternative or future histories. Too often, novels and stories of future history seem to be taking the interpretations of Gibbons, Toynbee or (horrors!) Durant as their models and inspiration. That is like writing about future scientific developments with the work of 18th century science and two-

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decades-old *Mechanics Illustrated* articles as one's source of inspiration. For a start, check out the works of the leading French historians such as Ferdinand Braudel, Le Roy Laduire and Georges Duby. France has led the world in the field of history since the 1950's and much of the work of French historians has focused on factors of interest to science fiction readers, such as the effects of climate changes, new technologies, and the persistence and decay of cultural values.

NICHOLAS F. O'RIORDAN
St. Charles, IL

Dear Mr. Schmidt,

I have been reading Analog since long before it became Analog, and have enjoyed the editorials now at the pen of the third editor that I can recall. My longevity as a reader may actually extend further back, since I clearly remember reading *Astounding* when I was an intern nearly thirty-five years ago.

I write you specifically to congratulate you on your infallibility editorial (June, 1984), and to tell you how thoroughly I enjoyed it. I agree with your analysis of the problems of funding of Medicare, in many ways, and also your own analysis of the problems of inappropriate lawsuits for claimed malpractice. Needless to say, I can be expected to believe that there are a number of flies in the ointment.

Grossly unrealistic expectations of what physicians and hospitals can do has certainly created many of the problems that we face today, as well as the unrealistic expectations generated by politicians who appear to be rather good at leading people to believe in that governmental and fiscal impossibility, something for nothing. While I grant that there is such a thing as real malpractice, I appreciate your observation that it is the exception rather than the rule, that most of us as physicians really do care and really do give it our best shot.

I believe that we as a nation and as a society have yet to come to grips with hard decisions that we must make, including how much of our gross national product we are willing to spend on health care and in what ways we want to spend it. I firmly believe that there is not enough money in the world—let alone in the United States—to provide all of the health care services that everybody desires. If we chase that rainbow we are doomed.

Again, I thoroughly enjoyed your editorial and I look forward to more of the same in the future.

THOMAS R. NOLAN, M.D.
Atlanta, GA

Dear Mr. Schmidt:

Your editorial in the June 1984 *Analog* commented superficially on the Medicare changes but missed the real problem.

The remarkable progress of biomedical technology since World War II has made it possible for physicians to keep sicker and sicker patients alive longer and longer at greater and greater cost.[1] The fastest growing segment of the population is composed of individuals over 75. Most of these are women. This group has diseases ranging from Alzheimers, senile dementia, and Huntingtons disease to strokes, heart disease, cancer, cataracts, and assorted minor illnesses. Many reside in nursing homes, draw social security, and have medical treatment paid for by Medicare. Almost none of these individuals is working, and they represent a growing drain on the taxpayers of this country.

At the other end of the spectrum we have the ability to save the life of pre-

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mature infants who weigh less than a pound at birth. The cost for the first year of life of such infants is about $350,000. At three to four years of age this child will be put into an institution; you can save a small fetus, but you can't make it develop into a normal child. The more expensive premature nurseries we build, the more premature infants we can maintain in institutions for a longer time at a greater expense.

The American hospital is the best treatment center in the world. It is expensive and geared to single disease or single organ failure in otherwise healthy people. The main move the government made in the DRG structure was to refuse to pay for terminal care in a hospital. This will decrease the cost of dying.

We face an unprecedented problem. The bottom line is the same as it was 10,000 years ago—everybody dies! We are the first society with so much medical ability to prolong dying that we bankrupt ourselves doing it.

There is no historical answer. The citizens of the United States of America will have to evolve a religious, moral, ethical, and economic plan to master this problem. There is no option of regaining ignorance.

SAM W. BECKER, JR., M.D.
Winter Haven, FL

[1]Evans, R.W., "Health Care Technology and the Inevitability of Resource Allocation and Rationing Decisions." *JAMA* 1983: 294: 2047-53, 2208-19.

Sirs,

Dr. Schmidt's editorial in the June '84 issue rightly attacks the medical malpractice problem, but mistakenly puts the blame on courts who "have reinforced this absurd requirement of infallibility." From the context, and the other references to "courts" and "judges," one may reasonably infer that he means "trial judges."

I suggest that he look into some of these cases and see how the judge stated the law in his instructions to the jury (the trier of fact). In no case will he find the law stated as requiring infallibility, or stating that if a patient dies, his doctor is automatically liable. He *will* find that the jury is to decide whether the doctor's conduct was reasonable in the light of current medical standards, as shown by the evidence, or whether it was unreasonable ("negligent")—the same standard Dr. Schmidt advocates.

If juries translate this into a legal requirement that they must always sock the doctor, the problem lies with the public from which they come, not the judges.

In the same issue, Mr. Stine announces that the high cost of labor makes repair an uneconomical alternative to junking and replacement. He might have noted that we thus waste (and lose forever) non-renewable resources (metals, industrial diamonds, etc.) in order to use a renewable resource (human labor). This is economy only in the short run, like air pollution; ultimately, it impoverishes the earth.

J. B. LAWRENCE
San Bernardino, CA

Of course the law doesn't say *doctors are expected to be infallible, but what matters is not what the law* says, *but what judges and juries* do—*which is not necessarily the same. There is room for doubt as to how many judges and juries are capable of making a reasonable evaluation of what can be expected.*

As for "non-renewable resources," things like metals are "lost forever" only if you shoot them off to some place where you can never catch up with them again. Most uses simply change their

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form, and "trash miner" may become an essential occupation in the future.

Dear Dr. Schmidt:

In your recent editorial ("Infallibility Required," June 1984), you stated that physicians' fear of medical malpractice lawsuits induces excessive testing. This practice, of course, increases medical fees.

Almost everyone would agree that medical fees are high and that they are not likely to decrease in the future. Nor does anyone doubt that testing expenses contribute to these fees. The motivation to order tests, as you pointed out, undoubtedly bears a causal relationship to the risk and fear of malpractice lawsuits.

The question is, what can be done to reduce the fear of medical malpractice lawsuits and the concomitant increased medical fees due both to med-mal insurance premiums and to c.y.a. excessive testing? Frankly, I was disappointed in your answer. You stated that the public and the courts harbor grossly unrealistic expectations of what doctors can do. It follows that you believe the public should expect *less* from the medical profession and that doctors should be encouraged to perform fewer tests. Your editorial represented a surprisingly anomalous point of view from the world's most prestigious SF magazine. I expect a more progressive attitude from those of us who spend time on both sides of the boundary between reality and autism.

You and I and most of *Analog*'s readers were brought up to believe not only that improved health and well-being are in store for us all but that immortality itself is around the corner. Some time ago, Arthur C. Clarke said that those of us who are alive in the year 2000 A.D. will live forever. I appreciated and believed that statement and have even come to, well, *rely* on it!

You're damned right the public has high expectations. Outside of the nearly sacrosanct medical profession, every other field of endeavor is accountable to the public and strives to reach its expectations. The public has waited long enough for substantive medical progress and is now demanding it through legal actions.

Rampant medical malpractice and/or incompetence is not due to the legal system nor to the public's expectations. It is due to our system of medical education. Ask yourself, who is admitted to medical school? Those who have performed exceptionally well in high school and college. That is, those whose capacious minds are suitable for memorizing details and spewing forth voluminous amounts of information during examinations. Verbatim. They are the ones who are rewarded with scholastic grades sufficiently high to be chosen for medical school.

These are not necessarily creative students, but merely organized plodders —those who, with antlike persistency, perform predefined tasks set before them in a predefined manner. With precious few exceptions, there is very little creativity in medicine. The education system weeds them out. This also explains why excessive tests are ordered. Requesting an overabundance of test data is simply a technique acquired by students in medical school. When it doubt, bedazzle 'em with data!

And from this highly regarded group of encyclopedic individuals, who devotes his or her career to medical research? Again with only minor exceptions, those who cannot make it financially in private practice: on the spectrum of initiative, the bottom of the heap. Thus, the few people who may

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be in a position to advance the state of the art of medicine are precisely those least qualified to do so.

Is it any wonder that so many diseases remain incurable or that the solution to a great many medical problems continues to be excision, ablation, resection, extirpation, amputation and other surgical procedures bordering on barbarism? Creative people are in fields such as the physical sciences and the arts. Who do you suppose is left behind in *medicine*?

We all agree that it would be best not to have malpractice lawsuits driving up the cost of medical care. The solution, however, is not to eliminate such legal proceedings, but to eliminate the *need* for them. Ask not why the public's expectations are so high, but why physicians cannot meet them. Lawsuits can be avoided and I am confident they will be, but only when the medical profession rises to the level of competence that, some 2300 years since Hippocrates, we the public expect and deserve.

MARK LEVY

Vestal, NY

The public has had *a great deal of substantive progress in medicine since the time of Hippocrates, and has every right to expect doctors to do all that is possible with the present level of knowledge. But to expect it to be able to do anything and everything, as you apparently advocate, is, I repeat, unrealistic and unreasonable.*

Dear Dr. Schmidt:

Your editorial about DRGs was interesting but did not cover new ground. The point you made has not escaped most thoughtful physicians (sure there are other kinds). There are many of us out here trying to be logical about the problem of medical costs, DRGs, third-party payments, Medicare, etc.—but getting nowhere with the politicians, mostly because some group which gets a lot more sympathy than "wealthy" doctors always hollers loudly when their toes are stepped on.

One point that I have not seen made, though I admit I don't know everything, is that it is a myth that medical care does not follow the law of supply and demand. The point people overlook is that the demand for health is nearly infinite: except for a few depressed people who wish to die, nobody has enough health, and so it is no wonder that the costs of medical care tend to rise. As soon as a new test or treatment is developed, somebody will come along to demand it be done on/to him. In fact, hoards of somebodies will come along!

It takes a very skillful physician to convince a scared patient that he does not need a double retro-reverse neutrino-laser scan when *Reader's Digest* tells him he does—especially when the patient thinks he is getting it "free" because he medical insurance is paid by his company. Unions, of course, never point out that the workers ultimately pay for the insurance in higher product costs. I suspect it is this increasing insulation of the payment from the patient's wallet that is one of the biggest culprits in the escalation of health costs/demands.

BROOKS A. MICK, M.D.

Findlay, OH

Dear Dr. Schmidt:

The new Medicare regulations appear just as big a threat to American Hospitals as The Bomb, and I have been surprised how few feel inclined to protest them, or even try to understand them. You have certainly given a clear prospectus of this attempt to put red tape on the hemorrhage of health care costs.

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I think you hit the nail on the head. Millions that seem to be spent on health care are really being spent on one of the biggest gambling games in the country—and in history—malpractice suits.

I do think it is misleading to say Medicare "payments were in the form of payment for services rendered as billed by the hospital." Ginsburg and Sloan clarified this issue in a recent article: "HIAA [Health Insurance Association of America, the commercial health insurers trade association] claims that insurers who pay hospitals through methods other than the payment of charges—such as Medicare, Medicaid, and some Blue Cross plans—pay less than the cost of treating their beneficiaries and that, as a result, charge-paying patients (or their insurers) must pay more. It estimates the cost shift for 1981 to have been about 4.8 billion." . . . The authors note that the magnitude of payment differentials is necessarily imprecise, but give the best available figures from the 1981 American Hospital Association annual survey: Medicare paid only 80% of charges billed by hospitals [that is, of charges the hospitals billed for reimbursable services]; Medicaid 79%, Blue Cross 85%, and Commercial insurers 89%[1] I got interested in all this when I had thousands of dollars of uninsured hospital bills to pay for my husband. Nobody bothered to tell me that while I was expected to pay 100% of his bills, no big insurer really pays the full bill for anything.

RUTH A. REILLY

[1]Ginsburg PB, Sloan FA. "Hospital Cost Shifting." New England Journal of Medicine, 310:893-898, April 5, 1984. (This article from the Congressional Budget Office, U.S. Congress, and from the Department of Economics and the Institute for Public Policy Studies, Vanderbilt University may be obtained in reprint by writing to:
Paul B. Ginsburg, Ph.D.
Congressional Budget Office
House Annex #2, Rm. 419
Washington, D.C. 20515

They note: "The opinions and conclusions expressed herein are solely those of the authors and should not be construed as representing the opinions or policy of the National Center for Health Services Research, the Congressional Budget Office, or Vanderbilt University." ■

● Ever since discounting became popular for investment analysis in the mid 1960s, our technological and cultural advancement has been slowed. But it was not always thus. The great cathedrals of Europe were constructed over generations. The U.S. interstate highway program has taken about thirty years. One wonders how long the pyramids of Egypt took, and what percent of Egypt's gross national product they consumed.

Gordon R. Woodcock

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INDEX

Here is the Index To *Analog*'s fifty-fifth year: 1984, Volume 104. Entries are arranged alphabetically by author, with month and page. (There were two issues in December, abbreviated Dec and MidD.) Multiple entries by the same author are listed in chronological order. When the author's name and/or part of the entry's title is omitted, it is the same as that of the previous entry. Collaborations are listed under all authors, with cross-references. Unless otherwise noted, each entry is identified as a novelette (n), short story (ss), or fact article (a).

Andrews, Arlan Keith, "Critical Path," ss (omitted from index to 1983) ..... Dec '83 101
—— "Capitol Punishment," ss ..... MidD 136

Berger, Albert I., "The *Astounding* Investigation: The Manhattan Project's Confrontation with Science Fiction," special feature .. Sept 125
Bishop, Margaret M., "Axes, Saws, and Alphabets," a Feb 50
Bova, Ben, "Cement," special feature ..... Jan 90
—— "Free Enterprise," ss .... Feb 150
—— "Floodtide," novella ..... March 14
—— "Born Again," ss ..... May 150
—— (guest editorial) "Freedom from Fear" ..... Nov 6
Brin, David, "The Crystal Spheres," ss ..... Jan 128
—— "The Deadly Thing at 2.4 Kilo-Parsecs," a ..... May 66
Brouse, Richard A., (Probability Zero) "Washout" ..... March 74
Brown, Ray, "The Klode Factor," n ..... July 94
—— "The New Program," ss Oct 72
Buckley, Bob, "Peace in the Valley," ss ..... Aug 84
Burdick, Bruce Stanley, "Q.E.D.," n ..... Dec 96
Byers, Ed, "Simple Acts of War," novella ..... April 110
—— "Dead Man Switch," ss . June 150

Callin, Grant D., "Saturn Alia," n ..... July 16
—— "The Didactics of Mystique," serial ..... MidD 98
Caraker, Mary, "A *Thrrup* for Teacher," ss ..... March 90
Ceasar, Bruce E., "Second-Hand Smoke," ss ..... Jan 148
Chase, Robert R., "Seven Scenes from the Ultimate Monster Movie," ss ..... MidD 120
Chilson, Rob, "Slowly, Slowly in the Wind," n ..... April 72
Clarke, J. Brian, "The Expediter," n ..... Feb 12
Conley, Rick, "The Man Crouching in the Corner," ss .... June 90
Cramer, John G. (The Alternate View) "When Proton Meets Monopole," ..... July 85
———— "Other Universes: I" Sept 95
———— "Other Universes: II" ..... Nov 141

Dalmas, John, "Gullikksen and the 500-Pound Hallucination," ss ..... Feb 60
Delaney, Joseph H., "A Slip of the Mind," n ..... Feb 108
—— "Chessmen," n ..... April 14
—— "The Next Logical Step," n ..... Oct 86
—— "Thus Began the Death of Dreams," n ..... Nov 122
—— "The Shaman," n ..... Dec 148
—— "Dragon's Tooth," n .... MidD 146
—— (with Marc Stiegler) "Valentina," novella ..... May 100
———— "The Crystal Ball," novella ..... Aug 96
———— "The Light in the Looking Glass," n ..... Sept 102
Donaldson, Thomas, "The Galaxy Before Man," a ..... Sept 48
Dunn, Christopher P., "Advanced Machining in Ancient Egypt?" a ..... Aug 67

Easton, Tom (The Reference Library) ..... Jan 161
———— ..... Feb 163
———— ..... March 165
———— ..... April 164

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——— ..... May 163
——— ..... June 164
——— ..... July 165
——— ..... Sept 169
——— ..... Oct 145
——— ..... Nov 163
——— ..... Dec 143
——— ..... MidD 184

Fergusson, P.M., "Rogue's Gallery," poem ..... June 54
Flynn, Michael F., "Slan Libh," ss ..... Nov 146
Freitas, Dr. Robert A., "Xeno-psychology," a ..... April 41

Gauger, Rick, "Shooting Iron," ss ..... MidD 84
Gillett, Stephen L., Ph.D., "Those Halogen Breath-ers," a ..... Oct 60
—— "Second Planet—Second Earth," a ..... Dec 64
Gould, Steven, "Rory," ss .... April 96
Gribbin, John, "Perpendicular Worlds," ss ..... Sept 69
—— "Double Planet," ss ..... Nov 84
Gunn, James, "End of the World," n ..... Jan 70
—— "Man of the Hour," n ... Oct 106

Haldeman, Jack C. II, "A Very Good Year," ss ..... Dec 120
Harness, Charles L., "Summer Solstice," novella ..... June 12
Held, A. (with P. Yodzis), "On the Einstein-Murphy Inter-action," a ..... MidD 31

Iverson, Eric G., "Herbig-Haro," n ..... Oct 152
—— "Hindsight," n ..... MidD 42

Janifer, Laurence, "Final Draft," ss ..... Jan 144
—— "The Samaritan Rule," ss ..... March 154
—— "Love in Bloom," ss .... MidD 130

Kapp, Colin, "Something in the City," n ..... Nov 14
Killough, Lee, "Symphony for a Lost Traveler," ss ..... March 140
Kirkwood, James, "Accounting System," ss ..... MidD 29
Klein, Jay Kay (Biolog), "James Gunn" ..... Jan 89
——— "Michael P. Kube-McDowell" ..... Feb 106
——— "Leo Summers" .... March 102
——— "Rob Chilson" ..... April 90
——— "Alison Tellure" .... May 91
——— "Vernor Vinge" ..... June 147
——— "Grant D. Callin" ... July 61
——— "Hilbert Schenck" .. Sept 95
——— "Marcia Martin" .... Nov 82
——— "Steven L. Gillett" . Dec 79
—— (Probability Zero) "Cen-tury of Progress" ..... Dec 80
—— (Biolog) "Kelvin Throop" MidD 183
Kube-McDowell, Michael P., "Menace," n ..... Feb 84

Landis, Geoffrey A., "Elemen-tal," novella ..... Dec 16
Lesney, Dr. Mark S., "Aliens Among Us," a ..... Jan 58
Ligon, Tom, "Inadvisable Ad-versaries," ss ..... Sept 138
Lombardy, Dana (On Gaming) Jan 93
——— ..... Feb 107
——— ..... March 103
——— ..... April 95
——— ..... May 65
——— ..... June 93
——— ..... July 93
——— ..... Aug 83
——— ..... Sept 101
——— ..... Oct 177
——— ..... Nov 69
——— ..... Dec 95
——— ..... MidD 129
Lyon, Richard K., "Top Secret Memo," ss ..... MidD 130

Martin, Marcia, (with Eric Vini-coff), "The Weigher," n . Oct 12
——— "Winter Snow," ss Nov 70
MacDonald, Gary, "A Breach of Security," ss ..... June 72
Moriyasu, Kei, "The Unseen Universe: Quarks and the New Ether," a ..... March 76

Nahin, Paul J., "Archival Voice," ss ..... Feb 72
Niven, Larry, "The Integral Trees," serial (conclu-sion) ..... Jan 14

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Oltion, Jerry, "Frame of Reference," n ..... Jan 94
—— "The Life of Boswell," ss Dec 130

Peirce, Hayford, "Progress," ss ..... MidD 78
Pohl, Frederik, "Criticality," ss Dec 82
Pournelle, Jerry (the Alternate View) "Deterrent or Defense?" ..... Feb 145

Quick, W.T., "Death or Glory," ss ..... May 92

Rainbow, Tom, "Behind Every Good Writer," ss ..... July 78

Schenck, Hilbert, "Silicon Muse," n ..... Sept 74
Schmidt, Stanley (The Editor's Page) "A Carrot for the Teacher" ..... Jan 6
———— "When is a Science?" ..... Feb 6
———— "Noise" ..... March 6
———— "Individuals and Statistics" ..... April 6
———— "Loyal Opposition" May 6
———— "Infallibility Required" ..... June 6
———— "Educational Mythology" ..... July 6
———— "Heirs Unapparent" Aug 6
———— " 'Tis the Season" . Sept 6
———— "The Too-Inclusive 'We' " ..... Oct 6
———— "Guilty Till Proven Innocent" ..... Dec 6
Sheffield, Charles, "The Dominus Demonstration," n ... April 72
—— "Nine Days' Wonder," ss ..... Oct 130
—— "The Hostages of Zark," MidD 10
Shew, Roland, "The Quality Throop," ss ..... Feb 140
Shwartz, Susan M. (The Reference Library) ..... Aug 167
Silbar, Margaret L., "Born-Again Ideas," a ..... June 55
Stiegler, Marc (with Joseph H. Delaney) "Valentina," novella ..... May 100
———— "The Crystal Ball," novella ..... Aug 96
———— "The Light in the Looking Glass," n ..... Sept 102
Stine, G. Harry (the Alternate View) "Global 2000: Dead Wrong" ..... Jan 124
———— "Memory and Perspective" ..... March 135
———— "What Price the Human Life?" ..... April 91
———— "Change: the New Factor" ..... June 86
—— "The Coanda Effect," a . July 62
—— (the Alternate View) "The Day Before" ..... Aug 152
———— "Hot House or Ice Box?" ..... Oct 102
———— "The Military Ratio" Dec 126

Tellure, Alison, "Low Midnight," ss ..... May 74
Thompson, W.R., "Friendly Environment," n ..... Nov 92
Throop, Kelvin, (guest editorial) "My Turn at Last!" ..... MidD 6
Trowbridge, Bob, "Science, Technology, and Lovers," special feature ..... July 76

Vaughan, Alan, "Toward a Technology of Psi," a ..... Nov 58
Vinge, Vernor, *The Peace War* (serial) Part One ..... May 10
———— Part Two ..... June 94
———— Part Three ..... July 116
———— Part Four ..... Aug 12
Vinicoff, Eric, "Repairman," n Sept 150
—— (with Marcia Martin) "The Weigher," n ..... Oct 12
———— "Winter Snow," ss Nov 70

Walling, William, "Star Dreck," ss ..... Aug 156

Yodzis, P. (with A. Held) "On the Einstein-Murphy Interaction," a ..... MidD 31

Zahn, Timothy, "Bête Noire," n ..... March 104
—— "Teamwork," ss ..... April 152
—— "Return to the Fold," n . Sept 12

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a calendar of analog upcoming events

13-16 January
12th Symposium on Principles of Programming Languages at New Orleans, La. Info: Mary S. Van Duesen, 34 Archer Street, Wrentham MA 02093. 617-384-2526.

18-20 January
RUSTYCON II (Seattle area SF conference) at Sea-Tac Hyatt, Seattle, Wash. Writer Guest of Honor—Gordon Eklund, Artist Guest of Honor—Kevin Johnson, Fan Guest of Honor—Steve Fahnestalk. Registration—$15 until 31 December 1984, $18 at the door. Info: Box 47132, Seattle WA 98146.

21-24 January
General meeting of the American Physical Society at Toronto, Ontario, Canada. Info: A.P.S., 335 East 45th Street, New York, NY 10017.

25-27 January
DECADENT CONFUSION (Ann Arbor area SF conference) at Plymouth Hilton. Guest of Honor—Allan Dean Foster, Fan Guest of Honor—Julia Ecklar, TM—Marty Burke. Registration—$10 until 7 November, $13 until 1 January, $15 thereafter and at the door. Banquet—$13. Info: AASFA/ConFusion, Box 8284, Ann Arbor MI 48107.

26-27 January
CHIMERACON II (North Carolina SF conference) at Carolina Union, UNC Chapel Hill, North Carolina. Guest of Honor—Karl Edward Wagner, other guests: Manly Wade Wellman, Frances Garfield, Allen Wold, David Drake, M.A. Foster, Walter Meyers. Registration—$4 in advance; $2.50/day at the door. Info: Dorothy M. Wright, 102-D Todd Street, Carrboro NC 27510. 919-967-3049.

1-3 February
TAKE MY CON . . . PLEASE (Humor-oriented SF conference) at Sheraton Northwest, Silver Spring, Md. Guest of Honor—Diane Duane, Artist Guest of Honor—Phil Foglio. Registration—$10 in advance. Info: W.A.C.O., Box 335, Arnold MD 21012.

22-26 August 1985
AUSSIECON II (43rd World Science Fiction Convention) at Southern Cross Hotel, Melbourne, Victoria, Australia. Guest of Honor—Gene Wolfe, Fan Guest of Honor—Ted White Registration—A$30 until 31 December 1984 (supporting); A$50 until 31 December 1984 (attending). This is the SF universe's annual get-together. Professionals and readers from all over the world will be in attendance. Talks, panels, films, fancy dress competition, the works. Join now and get to nominate and vote for the Hugo awards and the John W. Campbell Award for Best New Writer. Info: Aussiecon Two, GPO Box 2253U, Melbourne VIC 3001, Australia (use airmail); Fred Patten, 11863 West Jefferson Blvd. #1, Culver city CA 90230 (membership info); jan howard finder, Box 428, Latham NY 12100.

30 August-2 September 1985
NASFiC 1985 (North American SF Convention, officially The First Occasional Lone Star SF Convention & Chili Cook-off) at the Hyatt Regency Austin and Palmer Auditorium, Austin, Texas. Guest of Honor—Jack Vance, Artist Guest of Honor—Richard Powers, Fan Guest of Honor—Joanne Burger, TM—Chad Oliver. Registration—attending $25 until 30 June 1984, supporting—$15. Info: NASFiC, Box 9612, Austin TX 78766.

—Anthony Lewis

Items for the Calendar should be sent to the Editorial Offices six months in advance of the event.

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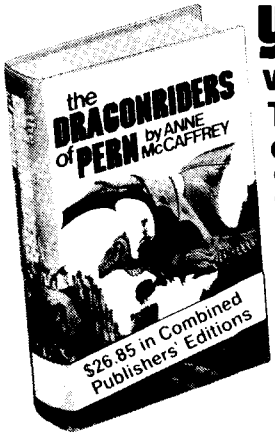

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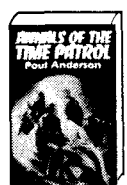

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